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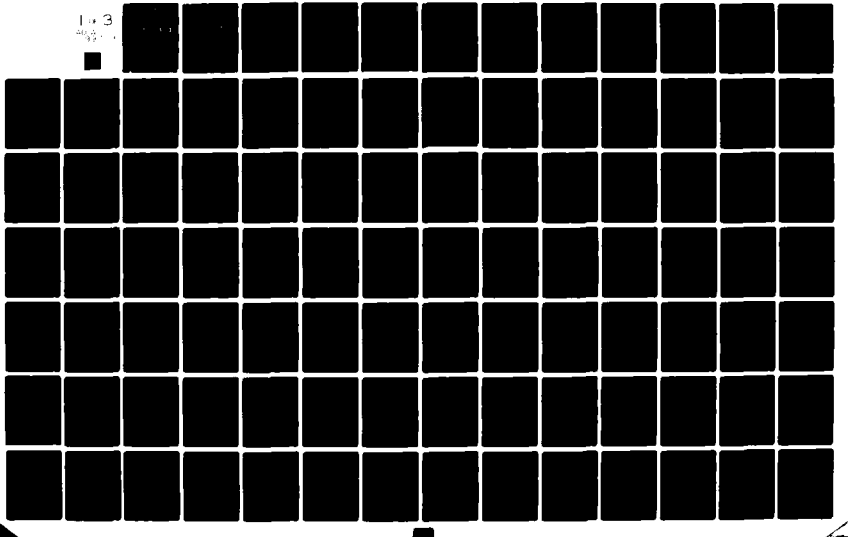

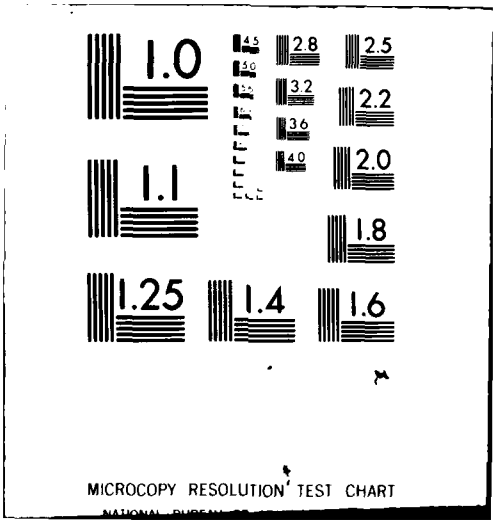
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MADISON and ST. CLAIR COUNTIES, ILLINOIS

ENVIRONMENTAL INVENTORY REPORT

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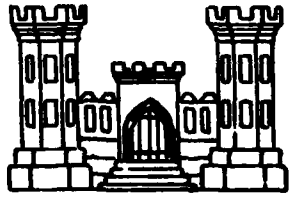

Volume 3 of 6

Prepared by: Environmental Researchers of Edwardsville, Inc.

Prepared for: U.S. Army Engineer District, St. Louis - Corps of Engineers

St. Louis, Missouri 1981

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This six volume set represents a thorough environmental inventory of the Cahokia Canal/Harding Ditch Drainage Area in Madison and St. Clair Counties of Illinois. It was prepared as background information for a St. Louis District Army Corps of Engineers multi-purpose planning study.

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EAST ST. LOUIS AND VICINITY, ILLINOIS
CAHOKIA CANAL DRAINAGE AREA
MADISON AND ST. CLAIR COUNTIES, ILLINOIS

ENVIRONMENTAL INVENTORY REPORT

VOLUMES 1 AND 2

PHYSICAL ELEMENTS

VOLUME 1 - HYDROLOGICAL ELEMENTS

I GENERAL (INCLUDING FLOOD PROBLEMS) -*Koepke*

II WATER AND SEDIMENT QUALITY -*Thomerson*

VOLUME 2 - ADVERSE ENVIRONMENTAL FACTORS

III AIR POLLUTION -*Thornton*

IV NOISE POLLUTION -*Thornton*

VOLUME 3

BIOLOGICAL ELEMENTS

V HABITATS -*Kulfinski, Thomerson*

BIOLOGICAL COMMUNITIES

AQUATIC COMMUNITIES

VI MACROPHYTES AND PHYTOPLANKTON -*Kulfinski*

VII ZOOPLANKTON AND BENTHOS -*Myer*

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TERRESTRIAL COMMUNITIES

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X ANIMALS, GENERAL -*Parker*

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XVII CRIME - *Ridenour*

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XIX ECONOMY/LAND USE AND GROWTH - *Koepke, Robert*

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XXI PROBLEMS AND OPPORTUNITIES - *Koepke, Kulfinski, Thomerson, & Thornton*

VOLUME 6

ATLAS

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SECTION V
BIOLOGICAL ELEMENTS - HABITATS

PREPARED BY
FRANK B. KUEFINSKE, PH. D.
JAMIE E. THOMERSON, PH. D.

INTRODUCTION

A variety of habitat types exist in the Cahokia Canal Drainage Area, of which eleven are recognized and discussed herein. Three urban and eight nonurban habitats are studied within each of three parts of the study area: (1) floodplain, (2) upland, and (3) Chouteau Island. A summary of the cumulative area of each habitat type is provided in Table V-1 and the distribution of these habitat types is given in Figure V-1*

URBAN HABITATS

Urban habitats are not only those which are subdivided for homes, business and industry, but also those used, modified, and managed for human needs associated with urban settings. In general, urban habitats do not have agricultural, wildlife or fishery uses as their primary reason for existence.

In Figure V-1, urban habitats are subdivided on the basis of percentage of the area devoid of vegetative cover. City habitats have less than twenty percent vegetative cover, suburban habitats have from thirty to eighty percent vegetative cover, and exurban habitats are from eighty-one to one hundred percent covered with vegetation. Urban habitats are concentrated in the Granite City area of the floodplain and around Collinsville in the uplands.

City Habitats

City habitats cover 4,658 acres or eight percent of the floodplain but only 130 acres or less than one percent of the upland. As shown in Figure V-1, rail yards account for much of the city area in the flood-

*All figures referred to are located in Volume 6 of 6 of this Environmental Inventory Report

Table V-1

Size and Relative Importance of Biological Habitats, Found in the Floodplain, the Upland, and Chouteau Island Portions of the Cahokia Canal Drainage Area

Habitat	Floodplain		Upland		Chouteau Island	
	Acres	Percent	Acres	Percent	Acres	Percent
URBAN						
City	4,658	8	130	0	148	3
Suburban	10,626	19	10,018	32	511	11
Exurban	4,631	8	1,391	4	130	3
Subtotal	19,915	35	11,539	37	789	16
NON-URBAN						
Agricultural	29,105	51	11,740	37	2,626	55
Old Field	184	0	676	2	-	-
Upland Forest	-	-	7,387	24	-	-
Floodplain Forest	3,757	7	-	-	783	16
Sandbars	-	-	-	-	115	2
Mudflats	47	0	-	-	-	-
Wetland	1,600	3	-	-	480	10
Lakes and Streams	2,483	4	70	0	10	0
Subtotal	37,176	65	19,873	63	4,014	84
TOTAL	57,091	100	31,412	100	4,803	100

Source: Calculated from Figure V-1 in Volume 6 of 6 of this Environmental Inventory Report.

plain. Factory areas, parking lots, and business districts account for most of the rest. Dump grounds are a major component of city habitat in the floodplain, particularly the land fill area bordered by Interstate 70/55, Illinois Route 203, and the Cahokia Canal. The area covered by the Granite City Steel ponds in Horseshoe Lake falls into the city habitat classification.

Suburban Habitats

Suburban habitats cover 10,626 acres or nineteen percent of the floodplain and 10,018 acres or thirty-one percent of the upland. The location of this habitat is given in Figure V-1. The bulk of the suburbs is covered by homes and yards, but such features as major highways and their rights-of-ways and some railroad tracks and their rights-of-ways also fall into this category. Suburban habitats are biologically richer than city habitats. There is more vegetation and more diversity of food and cover. Yard birds (cardinals, bluejays, robins, starlings, mocking birds, etc.) are more common in suburban areas, as are squirrels and rabbits. Raccoons and opossums are occasionally encountered.

Exurban Habitats

Exurban habitats cover 4,631 acres or eight percent of the floodplain and 1,391 acres or four percent of the uplands. They are scattered throughout the area, often contiguous with other urban habitats, as is shown in Figure V-1. Exurban habitats vary greatly from a biological point of view. They range from uniform mowed grass areas, such as school yards, athletic fields, grassed parking lots, levees, and golf courses, to very diverse areas such as undeveloped

housing and industrial tracts, wooded parks and the like and thus cannot be characterized as a uniform biological habitat. A school yard or athletic field might offer less habitat for wildlife than some of the city areas.

NONURBAN HABITATS

Agricultural Habitats

Agricultural habitats are found where agricultural crops have been substituted for natural vegetation. The agricultural habitats include fields containing a single crop species (monoculture) rather than botanical diversity. The pre-agricultural diverse communities contained more cover, more food (foliage, seeds, roots, and fruits), and more microclimates than the present artificial agricultural communities. Furthermore, agricultural communities are harvested, at which time their cover, production, food, etc. all decline or at least change. Also, plants and animals adapted to being part of the bottomland communities which originally existed on the floodplain are not usually adapted for existence in agricultural fields, except for a few which are agricultural pests and are eradicated by cultivation or by pesticides.

Agricultural habitats make up 2,626 acres or fifty-five percent of Chouteau Island, 29,105 acres or fifty-one percent of the floodplain and 11,740 acres or thirty-seven percent of the upland, and are the most significant habitat (43,471 total acres or forty-six percent of the total area) in the study area. This habitat distribution is shown in Figure V-1. Floodplain agriculture is practiced where drainage permits and wherever urban habitats have not yet encroached.

Upland agriculture is practiced on the more or less flat ridges but not in the ravines, which are too steep for agricultural equipment or practices.

Principal crops in the area are field corn, soybeans, and winter wheat, with smaller amounts of horseradish, truck crops, strawberries, orchards, sorghum, and a few acres of sunflowers. The principal animal life associated with the corn, wheat and soybean fields are grackles, starlings, crows, rabbits, small rodents, groundhogs, opossums, raccoons, snakes, toads, and various insects (corn earworms, cutworms, grasshoppers, etc.). Agricultural fields are not well utilized by wildlife, but, after harvest, stubble and straw shelter some animals and the spilled grain provides forage for many.

Old Field Habitats

Old field habitats result from abandonment of agricultural fields and are successional communities. They contain many annual and biennial plant species at first, followed chronologically by perennial grasses and herbs, shrubs, and finally climax vegetation. Old fields are good habitat for a variety of successional groups of animals, however agricultural use of land is so intensive in the area that little is abandoned to provide old field habitat. Old field habitat represents 184 acres or less than one percent of the floodplain, and 676 acres or two percent of the upland. The greatest amount of old field habitat, as shown in Figure V-1, is on the campus of Southern Illinois University at Edwardsville, and game animals such as deer, doves, and quail have been observed there.

Upland Forest

Upland forest habitats are found on the slopes and bottoms of

ravines and valleys in the upland, as shown in Figure V-1. Originally, in the upland, prairie covered the ridgetops, dry upland forest the slopes, and finally mesic forest, grading to floodplain type, occupied the bottoms. The typical dry forest of the slopes was probably dominated by red oak, white oak, hickories, and sugar maple. The bottoms of the ravines were probably dominated by such species as black cherry, cottonwood, sycamore, basswood, elm, hackberry, and many others. Upland forest occupies 7,387 acres or twenty-four percent of the upland area. It is suitable habitat for upland forest animals such as squirrels, deer, foxes.

Floodplain Forest

Floodplain forest habitat at one time occupied much of the floodplain, especially that along watercourses and pond/lake areas. Due to abundant spring rains and extreme summer droughts, it is difficult to distinguish among swamps (category 7 wetlands), some seasonally flooded basins or flats (category 1 wetlands), and floodplain forests-- actually, they intergrade (Sliaw and Fredine, 1971). Floodplain forest habitat, shown in Figure V-1, occupies 783 acres or sixteen percent of Chouteau Island and occupies 3,757 acres or seven percent of the floodplain. Its total acreage has been greatly diminished, except in standing water areas, since agriculture has aggressively occupied all the territory practical. Some of the animals occupying this habitat include the squirrel, rabbit and raccoon.

Sandbars and Mudflats

Sandbar habitat, shown in Figure V-1, makes up 115 acres or two percent of Chouteau Island, with the degree of sandbar exposure

varying according to river level. Sandbars are essentially absent from the floodplain and upland. They represent the first stage of primary succession. They are usually colonized by pioneer species such as annual herbaceous plants which are followed by willows and then by other early successional species. The lack of soil nutrients and water holding capacity combined with seasonal scouring make this a harsh habitat which is rather sparsely inhabited by animal and plant species, except transient ones.

Mudflat habitat occupies forty-seven acres or less than one percent of the floodplain. It is a seasonal phenomenon-- it is mudflat at dry times of the year and lakebottom at wet times. The only significant mudflat in the study area, as shown in Figure V-1, is at the southeast end of Horseshoe Lake. This mudflat has marsh vegetation and floating aquatics at its margins in the spring and fall but is exposed in summer. Wading birds use the mudflat in search of invertebrates, but most other vertebrate animals are lacking.

Wetland Habitats

Wetland habitats occupy 1,600 acres or three percent of the floodplain, 480 acres or ten percent of Chouteau Island. These wetland habitats, shown in Figure V-1, were mapped from aerial photographs (NASA, 1974), topographic maps (ISGS, 1967), and field surveys. Wetlands were classified following United States Department of the Interior wetlands classifications (Sliaw and Fredine, 1971). The study area was formerly a large natural floodplain and probably contained much wetland. The area was leveed and drained early in this century, making it available for farming and homesites. Most

of the wetlands, bottomland forest, and wet prairies which the area contained were destroyed until at present the area consists largely of suburbs and farms. Area wetlands consist of either lakes and lake margins or fields with sufficient standing water in the spring to prohibit plowing. Many wetland sites have been disturbed or destroyed by opportunistic farming which encroaches partially or completely upon wetlands during periodic dry years. For example, corn was at one time planted on the bottom of Horseshoe Lake and attempts to cultivate wetlands near Valmeyer (south of the study area) were made in 1976. The latter wetland area was plowed and disked and then abandoned. In midsummer, 1976, (at Valmeyer) sprouts of some perennials (water lilies and sedges) were making feeble attempts to regenerate, but the nature and composition of the communities had been altered. Similar and more drastic practices have greatly reduced the acreage of wetlands in the area.

The current wetlands consist of spring-flooded forests (type 1) and a number of zonally-distributed water-margin communities which represent stages in the successional cycle of lakes and ponds. Most ponds and lakes of this area do not exceed three feet average depth. The area wetlands (aside from the type 1 mentioned above) are largely marginal vegetation which is classified as type 3, inland shallow fresh marshes, which are dominated by grasses, sedges, water primrose, smartweeds, lizard's tail, cattail, arrowhead, water-plantain, giant bur-reed; type 4, inland deep fresh marshes, which are dominated by duckweeds, spatterdock, waterlily, bullrush, and bladderwort; and type 6, shrub swamps, which are dominated by buttonbush, willow,

swamp-privet, dogwood, and deciduous holly. The bodies of water are too shallow to include type 5 wetlands.

In general, the wetlands consist of type 1, which farmers have occassionally left standing as woodlots and types 3, 4, and 6 which are successional zones found at the margins of lakes and ponds.

These principal large wetlands, shown in Figure V-1, are those associated with (A) Horseshoe Lake, (B) Dobrey Slough, (C) McDonough Lake, (D) the area at the northeast corner of the intersection of Interstate 70 and Black Lane (just east of Cahokia Canal), and (E) the area southwest of Horseshoe Lake (south of Interstate 70 and west of Illinois Route 111).

Lakes and Streams

Lakes and ponds make up 2,483 acres or four percent of the floodplain, ten acres or less than one percent of Chouteau Island, and seventy acres or less than one percent of the uplands. The small upland streams vary greatly in flow. All become intermittent over most of their length during dry periods. Typical localities are described in Table V-2. These creeks have alternating pool and riffle habitats and are well shaded in the upland. They are small streams seldom more than ten feet wide, usually less than three feet deep (although there are scattered deep pools up to six feet deep). The bottom is usually sand to mud in pools and gravel to broken rock in the riffles.

Streams do not exist as such on the floodplain. Most flowing water moves through ditches. Samples of these habitats are described in Table V-2. Lakes and ponds in the floodplain fall into approximately

Table V-2

Aquatic Sampling Sites

Site 1 Cahokia Canal at Hwy. 50 (Hwy. 3). Below box culvert under Hwy. Just south of National City Police Dept. and Royal Packing Company. Pig farm just south of canal. Width: 30' to 60'. Steep mud banks, no cover. Usually fairly strong flow. Depth: 2' to 10' plus depending on flow, mud bottom.

Site 2 Cahokia Canal at Hwy. 111 north of Interstate 70. Banks steep, weed and tall grass along banks. Depth: usually 6' plus, width at normal flow: ± 40'. Some logs in channel, usually strong flow.

Site 3 Horseshoe Lake Outfall Canal. North of railroad tracks at Hwy. 111. Flow variable, into or out of lake or none. Collecting site E of Hwy. Bridge canal divided by Island. Depth to 3' at normal flow. Banks not steep, with high grass and weeds. Creeping water primrose and smartweed along margins. Bottom organic-rich mud. Logs and branches in water. Tree cover along south bank to west of highway.

Site 4 Cahokia Canal at Sand Prairie Road north of Interstate 70. Banks steep, some grass and weeds, little marginal vegetation. Bottom slick clay mud. Sample site west of bridge. A few willows along bank, a few sticks and logs in water, flow usually strong. Width at normal flow: 10' to 15', depth: 2' to 3'. Site is above confluence with Canteen Creek.

Site 5 Schoolhouse Branch at Hwy. 157 (old Hwy. 40). Sample site on west side of highway. Rocky riffle at bridge. Sand and mud bottom riffles and pools above bridge. Pools to 5' deep. Banks gradual, open on inside of bends, steep and undercut on outsides. No aquatic vegetation. Large trees and tall weeds along shore. Scattered logs in water and tree roots along undercut banks.

Site 6 Cahokia Canal at railroad bridge near Edelhardt Lake by Collinsville-Granite City Road, south of Grey's farm. Steep high banks, sand and mud bottom, 10' plus wide to 2' deep at normal flow. Little flow apparent. Banks with little cover, no aquatic plant. Trees on west bank to south of railroad.

Table V-2 (con'd)

Site 7 Burdick Branch at Hwy. 157 (old 40). Banks wooded except at highway right-of-way and width up to 10', very shallow, small riffles and pools. No aquatic vegetation, bottom sand, mud and rubble. Some organic debris in water.

Site 8 Judy's Branch at Hwy. 157 (old 40). Very similar to site 7, but up to 15' wide, 1' to 2' deep in pools.

Site 9 Cahokia Canal at Mitchell Road (old Hwy. 40), north of Int. 270 and just west of Sand Prairie Road. Width to 50', depth to 3'. Full of logs, old tires, etc., wooded banks, covered with duckweed. Above highway and for 50 to 100 yards below highway, no flow apparent. Bottom organic muck.

Site 10 Mitchell Ditch at Hwy. 162. Due south of Microwave tower, banks open, fields on either side, width to 30'. Pool south of highway then cattails. Hard mud bottom, some algae and creeping water primrose along banks of pool. Channel recently cleared by land owner. Deeper pools with riffles or no flow connecting.

Site 11 Long Lake at Hwy. 111 just south of Pontoon Road. To 200' wide. Depth: to 3'. Soft mud bottom, back yards on shore. Shoreline with trees, various docks, rip-rap, etc. Water fairly clear to turbid, little aquatic vegetation. Many logs and branches on bottom. Sampling site east of Hwy. 111.

Site 12 Moellenbrocks at Elm Slough at Hwy. 111, just north of Collinsville/Granite City Road. Shore open, gently sloping. Marsh to east and west. Water pooled, may be connected with Horseshoe Lake depending on water level. Much creeping water primrose, smartweed and scattered cattail patches. Some duckweed. Depth: to 4", bottom soft organic muck. Water often stagnant.

Site 13 Nameoki Ditch at Hwy. 162. West of railroad tracks. Steep bank with high weeds and grass, no trees. Bottom soft mud to 2' deep, often intermittent, little aquatic vegetation or cover. Blue-green algal mats on bottom. Little to no flow under normal conditions.

Table V-2 (con'd)

Site 14 Canteen Creek at USGS gauge at County Road Bridge, 500 feet upstream of Hwy. 157. Bank is steep, densely wooded upstream from the gauge and downstream on the south side. The bank is open about 150' downstream on the north side with tall grass and weeds. There is a low water dam at the gauge. Upstream is a long pool about 20' wide and 1 to 2 feet deep. The soft bottom is coal chips with some silt and sand. Below the dam is a rocky plunge pool about 30' wide and then rubble riffles and alternately sand, mud and rubble bottomed pools to 4' deep and 40-50 feet wide. There are several large logs and branches. There is a distinct sewage odor and some trash in the creek. The water is fairly clear. The upper pool bottom can be seen.

Site 15 Cahokia Diversion Channel at Old Poag Road. Banks very steep, weeds and grass near Hwy. Trees along channel above and below. Sampling site above Hwy. Depth: to 6', bottom sand and mud. Width: about 80', creeping water primrose and smartweed in patches along shore. Logs and branches common.

Site 16 Cahokia Diversion Channel at Hwy. 111. Banks very steep, heavily wooded, width: about 150', depth: about 2' to 3', bottom mud. Many logs and branches, small patches of creeping water primrose. Open areas of shore with tall grass and weeds.

Site 17 Cahokia Diversion Channel at low water dam. (Sampling site near Hwy. 3). Bank very steep. Width: to 200' depth: 3' to 6'. Mud bottom, some logs and branches in water. Banks wooded.

Site 18 Chain of Rocks Canal at head (near power line crossing). Width: about 400', depth: 9' ±. Banks steep, rip-rap. No aquatic vegetation. No noticeable flow. Heavy barge traffic and wave action.

Site 19 Chain of Rocks Canal at middle (below old bridge). (Like site 18).

Site 20 Chain of Rocks Canal at mouth (just above Tri-City dock area). (Like site 19).

Note: These sites are located on Figure II-1 in Volume 6 of 6 of this Environmental Inventory Report. This table is a duplicate of Table II-1 and is reproduced in this Volume 3 for the convenience of the user of this Environmental Inventory Report.

four categories. Long Lake and Horseshoe Lake are natural lakes. They are generally developed. The shore of Horseshoe Lake is margined by a thin band of herbaceous plants, willow, and cottonwood. Other pond areas are seasonally flooded parts of natural water bodies, such as McDonough Lake, shown in Figure V-1. Most other bodies of water are highly modified or man-made. There are many borrow pits, particularly those at the intersection of Illinois Route 111 and Interstate 55/70 and also Illinois Route 203 and Interstate 270. These have not been developed and are a predominate component of lake habitats in the area. Other pond areas have been developed for industrial use (the Granite City Steel ponds), use as sewage lagoons, and recreational use.

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SECTION VI

BIOLOGICAL ELEMENTS
MACROPHYTES AND PHYTOPLANKTON

PREPARED BY

FRANK B. KULFINSKI, PH. D.

AQUATIC MACROPHYTES

Five marshes were chosen on the basis of (a) their size and the presence and development of aquatic macrophytes and (b) their proximity to problem flooding areas. Three transects were obtained from each marsh. Each transect was three feet wide and long enough to extend from the center of the marsh to terrestrial vegetation. Percent cover was determined by ten foot intervals along the transect lines to show change with distance. Fifteen transects were studied, resulting in fifteen tables included herein. Jones (1963), Fernald (1950), and Steyermark (1963) were used as reference texts for the identification of vascular plant species.

Locations

Five wetland sites exhibiting marsh and/or swamp vegetation were studied and are shown in Figure VI-1.* These sites were chosen from USGS topographic maps (1954, photo-revised, 1968), from color aerial photographs (NASA, 1974), and from ground level inspection. Sites with considerable size, importance of location, and development of aquatic macrophyte vegetation were chosen.

Marsh 1 was located approximately three tenths mile north of the Black Lane-Interstate 70 intersection and three tenths mile east of Cahokia Canal. Transects 1 and 2 were located in the larger body of water, one tenth mile across, at the center of the wooded area between the levee to the west and a north-south blacktop to the east. Transect 3 was located in a small body of water at the southeastern edge of the wooded area at a point where the north-south blacktop approaches Interstate 70.

*all figures referred to are located in volume 6 of 6 of this Environmental Inventory Report.

Marsh 2 was located between Old Cahokia Creek to the west, Illinois Route 111 to the east, Interstate 70 to the north, and U.S. Route 40 to the south. Transects 1 and 2 were located at two ponds three tenths mile south of the Old Cahokia Creek and Interstate 70 intersection. Transect 3 began next to Illinois Route 111 between Interstate 70 and U.S. Route 40 and it extended to the west. Transect 3 had no open water surface.

Marsh 3 had three transects located along a mile of the northeast shore of Horseshoe Lake. Transect 1 was located at the end of a bay of Horseshoe Lake five tenths mile northeast of Moellenbrocks, five tenths mile north of the Collinsville-Granite City Road, and just east of Illinois Route 111. Transect 2 was located at the southeast shore of the mouth of the bay at Moellenbrocks, west of Illinois Route 111 and Collinsville-Granite City Road intersection. Transect 3 was located just west of Illinois Route 111 on the north side of the east end of the Walker's Island causeway.

Marsh 4 was located between Edelhardt Lake to the west, Cahokia Canal to the east, and the Collinsville-Granite City Road to the south. Two of three lakes northeast of Edelhardt Lake were involved. Transect 1 went east-west across the north end of the southernmost lake. Transects 2 and 3 were located at the southeast end of the next lake to the north, one quarter mile west of Cahokia Canal and south of the golf course.

Marsh 5 was located on McDonough Lake west of Illinois Route 157 and approximately one mile north of the Collinsville-Granite City Road. The lake is divided into a large northeast section and a smaller

southwest section by a causeway. Only the larger section was studied. Transect 1 was located midway along the southeast shore. An island was found in the center of the lake, and transect 2 extended northeast from the island and transect 3 extended to the southwest from the island.

Vegetation of Marsh 1

The data from Marsh 1, transect 1, are given in Table VI-1. The shallow (one to two feet) open water was dominated at the surface by water fern and contained bladderwort beneath the surface. Shallower water was dominated by water smartweed, rose mallow, and duckweed. Wet soil was dominated by buttonbush, black willow, and (at soil level), ricciocarpus. Ditch stonecrop, water smartweed, grass, and duckweed dominated the shallow water beyond the buttonbush - willow association. In this transect, segments 1 through 6 were open water, 7 through 12 were exposed wet soil, and 13 through 16 were a return to shallow water.

The data from Marsh 1, transect 2, are given in Table VI-2. The characteristic vegetation of the shallow (one foot deep) open water included bladderwort, water fern, and willow seedlings/saplings. Rose mallow was grouped in segments 11 through 17 and 21 through 27. Segments 17 through 27 were characterized by duckweed and water lotus followed by water smartweed and grass. The transition from open water to the thick cover of the wet terrestrial vegetation is evident from the decline in percent space between segments 13 and 17.

The data for Marsh 1, transect 3, are included in Table VI-3. This marsh unit was small and discontinuous with that which included

Table VI-1

Marsh 1, Transect 1. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Azolla mexicana	Water Fern	100	100	100	95	90	50										
Utricularia gibba	Bladderwort	7	7	3	1	1									10		
Polygonum coccineum	Water Smartweed	3	33	55	7	30	83	3				10		10	95	95	25
Hibiscus militaris	Rose Mallow	1	15	60	7	8			3	10	5	2	5	5		1	
Graminae sp.	Grass	1	tr	tr	tr	2	tr					10	10	10	25	15	50
Lemna minor	Duckweed	1	3	3	60	3	50	55	50			10	10	10		10	50
Ricciocarpus natans	Ricciocarpus	tr		tr					1								
Spirodela polyrhiza	Big Duckweed	tr	tr		tr												
Jussiaea repens	Primrose Willow			tr	7		1	3									
Cruciferae sp.	Mustard						1										
Cephalanthus occidentalis	Buttonbush							95	66	10	20	95	50				
Bidens sp.	Beggarticks							tr		5	1	5		tr	3		5
Salix nigra	Black Willow								33	33	95						20
Riccia fluitans	Riccia								5	3	10	5	3	3			
Galinsoga ciliata	Galinsoga								3		1	2					
Compositae sp.	Composite								tr								
Fraxinus lanceolata	Green Ash									5		5					
Rhus radicans	Poison Ivy									1							
Acer saccharinum	Silver Maple										3	1					
Lycopus americanus	Bugle Weed										3		tr				
Vitis sp.	Grape										1						
Diospyros virginiana	Persimmon										tr						
Penthorum sedoides	Ditch Stonecrop											tr	33	75	5	5	
Sium sauve	Water Parsley														8		
Sagittaria engelmanniana	Arrowhead															2	1
% Space		0	0	0	7	5	15	10	10	20	10	5	3	1	0	1	5

tr=trace

Table VI-2

Marsh 1, Transect 2. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Utricularia gibba	Bladderwort	25	15	5	5	5	10	10	10	5	10	10	5	5	50	80	80	80	30	20	20							
Azolla mexicana	Water Fern	10	5	10	10	5	3	10	5	5	15	5	10	5	20	25	20	50	10	10	10		3	3		5	3	10
Salix nigra	Black Willow	10	10	50	50	50	15	35	20	20	70	45	50	45	50	10	5											10
Populus deltoides	Cottonwood	3		1								tr					tr											
Hibiscus militaris	Rose Mallow					5				tr		25		15	10	30	5	3				2	20	50	40	20	45	45
Lemna minor	Duckweed																	3	50	50	50	10	10	15	15	10	10	
Nelumbo lutea	Water Lotus																	2	90	90	90	85	50	30	40	30	30	30
Polygonum coccineum	Water Smartweed																				tr	5	45	5	5			25
Graminae sp.	Grass																						10		30	60	70	50
Riccia fluitans	Riccia																						5					
Spirodela polyrhiza	Big Duckweed																							1	1			
Rumex verticillatus	Swamp Dock																								tr			
Sagittaria engelmanniana	Arrowhead																									20	10	
Penthorum sediodes	Ditch Stonecrop																									tr		3
Cephalanthus occidentalis	Buttonbush																										10	
Jussiaea repens	Primrose Willow																											tr
% Space		50	60	25	25	40	75	75	75	80	20	50	30	40	20	10	10	10	5	5	5	10	0	5	5	3	0	2

tr trace

Table VI-3

Marsh 1, Transect 3. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments								
		1	2	3	4	5	6	7	8	9
Lemna minor	Duckweed	90	95	95	95	95	10			
Populus deltoides	Cottonwood	10								
Salix nigra	Black Willow	10	5	5	5		50		5	50
Jussiaea repens	Primrose Willow	3			tr					
Saururus cernuus	Lizard's Tail					30	100	99	30	
Hibiscus militaris	Rose Mallow					10				
Polygonum coccineum	Water Smartweed							3		
Bidens sp.	Beggarticks							tr		
Labiatae sp.	Mint							tr	50	40
Impatiens capensis	Spotted Touch-me-not								10	15
Phytolacca americana	Pokeweed									30
% Space		0	3	3	3	3	0	0	3	0

tr=trace

transects 1 and 2. The open water was characterized by duckweed with cottonwood and willow seedlings/saplings (segments 1 through 6). Segments 5 through 8 contained an almost pure stand of lizard's tail. Segments 8 and 9 included willow, mint, spotted touch-me-not, and pokeweed (indicators of terrestrial habitat conditions).

Vegetation of Marsh 2

The data for Marsh 2, transect 1, are included in Table VI-4. The vegetation represents a gradual transition from a margin characterized by water smartweed with dodder, to rough pigweed, buttonbush, and tickseed with several less important species. The final segments included cottonwood and willow.

The data from Marsh 2, transect 2, are presented in Table VI-5. The vegetation had little transition from wet to dry evident. The vegetation nearest the water was mainly of rough pigweed and buttonbush. Black nightshade occupied a transition zone, followed by common ragweed, giant ragweed, and yam. Elderberry, giant ragweed, and cottonwood were the principal components of the most terrestrial segments.

The data for Marsh 2, transect 3, are presented in Table VI-6. The principal vegetation consisted of cattail, rose mallow, and duckweed, with a small amount of water smartweed interspersed. Water parsley contributed slightly to segments 14 through 19, and black willow, buttonbush, and wild water pepper contributed to the vegetation of the last six segments, indicating considerable soil moisture.

Vegetation of Marsh 3

The data of Marsh 3, transect 1, are given in Table VI-7. The segments nearest the water were characterized by duckweed, pri[illegible]se

Table VI-4

Marsh 2, Transect 1. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments									
		1	2	3	4	5	6	7	8	9	10
Polygonum coccineum	Water Smartweed	20	15			25		25			
Cuscuta sp.	Dodder	5		5				15	15		
Typha latifolia	Cattail		40								
Amaranthus retroflexus	Rough Pigweed		10	15	5	25	20	20	30		
Cephalanthus occidentalis	Buttonbush			15				40			
Bidens polylepsis	Tickseed Sunflower				3	5		30	50	100	85
Populus deltoides	Cottonwood				1					20	80
Graminae sp.	Grass						20				
Sium suave	Water Parsley								10		
Unknown vine	Vine									55	
Salix nigra	Black Willow										10
% Space		75	70	80	15	80	75	10	10	0	0

Table VI-5

Marsh 2, Transect 2. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Ambrosia artemisiifolia	Common Ragweed				33						90	100	95	60	
Cuscuta sp.	Dodder				5										
Amaranthus retroflexus	Rough Pigweed					50	70	70	60	40					
Polygonum coccineum	Water Smartweed					25									
Cephalanthus occidentalis	Buttonbush					10	20		10						
Solanum americanum	Black Nightshade							10	20	20					
Ambrosia trifida	Giant Ragweed										10	10		10	95
Dioscoria sp.	Yam											80	90	10	
Sambucus canadensis	Elderberry													15	15
Ipomaea pandurata	Wild Potato Vine													10	
Sium suave	Water Parsley													5	
Populus deltoides	Cottonwood														80
% Space		100	100	100	85	15	10	25	20	45	5	0	5	20	10

Table VI-6

Marsh 2, Transect 3. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22					
Typha latifolia	Cattail	65	65	65	45	45	45	45	50	50	55	60	60	60	60	65	65	55	40	35	30	30	30					
Hibiscus militaris	Rose Mallow	40	40	40	60	60	60	60	50	50	50	50	50	50	50	40	40	50	40	30	20	20	20					
Lemna minor	Duckweed	30	30	30	20	20	20	20	10	10	10	20	25	25	25	30	30	10	10	5								
Polygonum coccineum	Water Smartweed	5	10	1			5	5	5	10	10		5		1	5												
Alisma plantago-aquatica	Water Plantain					1			1																			
Sium suave	Water Parsley														5	1	5	1	5	1								
Salix nigra	Black Willow																	15		20	35	45	45					
Cephalanthus occidentalis	Buttonbush																	20	25				20					
Polygonum hydropiperoides	Wild Water Pepper																			10	20	15						
% Space		20	20	20	20	15	15	15	15	15	15	10	10	10	10	10	5	0	5	5	5	5	5					

Table VI-7 Marsh 3, Transect 1. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segement was on land.

Binomial	Common Name	Transect Segments 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Lemna minor	Duckweed	20	5	5	1	1											
Jussiaea repens	Primrose Willow		15	20	75	75	50	60	50	50	60	40	50	50	45	45	75
Gramineae sp.	Grass #1				5	10	10	40	50	40							
Sagittaria engelmanniana	Arrowhead									10						5	
Gramineae sp.	Grass #2										40	40	40	30	25	30	25
Cyperaceae sp.	Sedge										5	10	10				
Echinochloa crusgalli	Barnyard Grass										5			1	5		
Typha latifolia	Cattail											20	10	25	30	25	
Polygonum hydropiperoides	Wild Water Pepper											5		5			
Polygonum lapathifolium	Pale Smartweed																
Unknown	Perfoliate Leaf																
Dioscoria sp.	Yam																
Xanthium chinense	Cocklebur																
Hibiscus militaris	Rose Mallow																
Cephalanthus occidentalis	Buttonbush																
Gramineae sp.	Grass #3																
Salix nigra	Black Willow																
Ambrosia artemisiifolia	Common Ragweed																
% Space		80	95	90	5	20	50	10	0	0	0	0	0	5	5	5	0

Binomial	Common Name	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Lemna minor	Duckweed																	
Jussiaea repens	Primrose Willow	70	45	45	25			10		75	70	55						
Gramineae sp.	Grass #1				60	20	30											15
Sagittaria engelmanniana	Arrowhead				5						10							
Gramineae sp.	Grass #2	45	25	15		20	20	30	25		20	35	65	40	40	20		25
Cyperaceae sp.	Sedge	10			10	45	30	15	10				20	40	30	30	20	50
Echinochloa crusgalli	Barnyard Grass								10			15				25	60	5
Typha latifolia	Cattail	30	60	75			20	30	85	25	20	10						
Polygonum hydropiperoides	Wild Water Pepper					20		25										15
Polygonum lapathifolium	Pale Smartweed												25	30	50	45	20	
Unknown	Perfoliate Leaf																	
Dioscoria sp.	Yam																	
Xanthium chinense	Cocklebur																	
Hibiscus militaris	Rose Mallow																	
Cephalanthus occidentalis	Buttonbush																	
Gramineae sp.	Grass #3																	
Salix nigra	Black Willow																	
Ambrosia artemisiifolia	Common Ragweed																	
% Space		0	0	0	5	5	5	0	0	15	5	5	5	0	0	0	5	0

Binomial	Common Name	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Lemna minor	Duckweed																
Jussiaea repens	Primrose Willow										30	30					
Gramineae sp.	Grass #1		15	25	5	10				30	30	20					
Sagittaria engelmanniana	Arrowhead																
Gramineae sp.	Grass #2	30	40							35							
Cyperaceae sp.	Sedge	20	35				15	15									
Echinochloa crusgalli	Barnyard Grass	20	15	15	5	15	10	15	70	5			15				
Typha latifolia	Cattail										30	30	30	30		10	
Polygonum hydropiperoides	Wild Water Pepper	15	15	75	100	90	95	90	30	25	20	10	10				
Polygonum lapathifolium	Pale Smartweed									15							
Unknown	Perfoliate Leaf	1															
Dioscoria sp.	Yam										5	1					
Xanthium chinense	Cocklebur											5					
Hibiscus militaris	Rose Mallow											5	20				
Cephalanthus occidentalis	Buttonbush												20	75	50	20	10
Gramineae sp.	Grass #3													20	60	100	95
Salix nigra	Black Willow															30	50
Ambrosia artemisiifolia	Common Ragweed																10
% Space		10	5	5	0	0	0	0	0	10	20	15	10	0	0	5	0

willow, and grass (#1), in that order. A grouping of arrowhead, grass (#2), sedge, barnyard grass, cattail, and wild water pepper followed, beginning at about segment 9. Pale smartweed was present in a transition zone in segments 28 through 32. Finally, rose mallow, buttonbush, grass (#3), and willow made up the ultimate transition to terrestrial habitat.

The data from Marsh 3, transect 2, are given in Table VI-8. Water lotus and duckweed occupied the open water followed by grass, water smartweed, barnyard grass, and a number of terrestrial (giant ragweed) and marsh (swamp milkweed) plants.

The data from Marsh 3, transect 3, are given in Table VI-9. Water lotus and duckweed occupied the open water with carex becoming important in the third segment. Segment 9 was marked by the occurrence of such terrestrial species as cocklebur, silver maple, and scirpus as well as by the disappearance of water lotus and carex. Segments 9 through 20 were marked by a variety of species ranging from marsh through terrestrial plants. Narrow-leaved cattail, which was rare in the study area, was present in segments 15 through 20.

Vegetation of Marsh 4

The data for Marsh 4, transect 1, are presented in Table VI-10. The first four segments included open water species such as spatterdock, primrose willow, bladderwort, and duckweed. There was then an abrupt transition in segments 4 and 5 to terrestrial species such as willow, cottonwood, sedge, beggarticks, and grass.

The data from Marsh 4, transect 2, are given in Table VI-11. Transect 2 measured thirty feet. Spatterdock, duckweed, and primrose

Table VI-8

Marsh 3, Transect 2. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																										
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23				
Nelumbo lutea	Water Lotus	5	50	50	50	50	50	50	50	10	10	100	100	100	100	80	75											
Lemna minor	Duckweed	1	1				1	1	10	60	60	10	10	10	5	1												
Graminae sp.	Grass														10	10	25											
Galinsoga ciliata	Galinsoga															5												
Polygonum coccineum	Water Smartweed															1	1	1	1	4	2	5						
Bidens sp.	Beggartick																1			3								
Populus deltoides	Cottonwood																	1		1		1	5					
Echinochloa crusgalli	Barnyard Grass																	1	100	95	38	85	25	15				
Ulmus americana	American Elm																				1							
Salix nigra	Black Willow																					5		30				
Lippia lanceolata	Fogfruit																					1	50	10				
Penthorum sedoides	Ditch Stonecrop																					1						
Ambrosia artemisiifolia	Common Ragweed																						1					
Amorpha fruiticosa	False Indigo																						30					
Asclepias incarnata	Swamp Milkweed																						10	10				
Cephalanthus occidentalis	Buttonbush																							5				
Smilax herbacea	Greenbriar																							1				
Ambrosia trifida	Giant Ragweed																							30				
% Space		95	50	50	50	50	50	50	45	40	40	0	0	0	0	15	5	50	0	1	20	5	1	5				

Table VI-9

Marsh 3, Transect 3. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Nelumbo lutea	Water Lotus	80	85	50	40	50	50	50	45	20											
Lemna minor	Duckweed	5	5	5																	
Carex sp.	Carex			50	60	50	50	50	55	25											
Polygonum hydropiperoides	Wild Water Pepper				1			5	10	10	10		15								
Eclipta alba	Eclipta					5		1	5												
Sagittaria engelmanniana	Arrowhead					1		5		1	40	15									
Graminae sp.	Grass						10				55										
Ammannia auriculata	Ammannia						5														
Xanthium chinense	Cocklebur									35		15									
Acer saccharinum	Silver Maple									15			10								
Scirpus sp.	Scirpus									10	10	45	15			45	45	40	50	40	20
Chenopodium alba	Lambsquarters											10									
Lippia lanceolata	Fogfruit											10									
Urtica dioica	Nettle											5	30	35	25	35	15	15	10	10	5
Lycopus americanus	American Bugleweed											1	15								
Impatiens capensis	Spotted Touch-me-not												25	60	45						
Solidago sp.	Goldenrod												10								5
Teucrium canadense	Woodsage													15	10						
Ambrosia trifida	Giant Ragweed													10							
Typha latifolia	Cattail														15				10	20	60
Polygonum coccineum	Water Smartweed															25					
Typha angustifolia	Narrow-leaved Cattail															5	65	70	60	50	10
Cuscuta sp.	Dodder															5	1	3			
Asclepias incarnata	Swamp Milkweed																				10
% Space		15	15	1	5	5	0	5	0	0	0	5	0	5	10	5	5	0	5	5	10

Table VI-10 Marsh 4, Transect 1. Percent cover in consectuive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments					
		1	2	3	4	5	6
Nuphar advena	Spatterdock	45	30	55	25		
Jussiaea repens	Primrose Willow	40	50	20	20	5	
Utricularia gibba	Bladderwort	15	25	20			
Lemna minor	Duckweed	10	5	1	15	45	
Salix nigra	Black Willow				50	95	50
Populus deltoides	Cottonwood					5	5
Carex sp.	Carex					10	
Bidens sp.	Beggarticks					1	3
Graminae sp.	Grass						20
% Space		30	25	25	20	10	10

Table VI-11 Marsh 4, Transect 2. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments		
		1	2	3
Nuphar advena	Spatterdock	80	60	
Lemna minor	Duckweed	10	5	
Jussiaea repens	Primrose Willow	5		
Polygonum hydropiperoides	Wild Water Pepper		15	10
Amorpha fruiticosa	False Indigo		10	40
Impatiens capensis	Spotted Touch-Me-Not			35
Boehmeria cylindrica	False Nettle			15
Polygonum coccineum	Water Smartweed			10
Cephalanthus occidentalis	Buttonbush			10
% Space		50	15	5

willow made up the standing water vegetation, followed by wild water pepper and false indigo, the first observation of this species in the study area samplings. Such marsh inhabitants as spotted touch-me-not, false nettle, water smartweed, and buttonbush followed.

The data for Marsh 4, transect 3, are given in Table VI-12. Transect 3 measured 170 feet in length. Spatterdock and duckweed were present in nearly all of the segments, indicating standing water. Grass, water smartweed, big duckweed, primrose willow, wild water pepper, and cattail made up the vegetation intermediate between the water and wet soil. Such species as swamp milkweed, water plantain, and arrowhead were found in wet soil in segment 16. Wet soil and woody plants, such as buttonbush, willow and cottonwood, were found in segment 17.

Vegetation of Marsh 5

The data for Marsh 5, transect 1, are given in Table VI-13. Transect 1 measured eighty feet in length. Standing water species such as duckweed, water lotus, bladderwort, and willow were found starting with segments 1, 2, and 3. Marsh vegetation was dominated by grass, cattail, buttonbush, wild water pepper, water parsley, and arrowhead in segments 6 through 8.

The data for Marsh 5, transect 2, are presented in Table VI-14. Transect 2 was eighty feet in length. Duckweed and spatterdock dominated the early stages of succession followed ultimately (segments 6 through 18) by grass, black willow, buttonbush, and smartweed.

The data for Marsh 5, transect 3, are presented in Table VI-15.

Table VI-12

Marsh 4, Transect 3. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Nuphar advena	Spatterdock	75	75	75	70	75	80	15	30			10	10	25	35	35	30	
Lemna minor	Duckweed	30	30	30	30	30	20	20	25		10	5	5	10	25	20		
Graminae	Grass			1	10	5			10	15	80	100	100	60	25	20		
Polygonum coccineum	Water Smartweed						10	75		45								
Spirodela polyrhiza	Big Duckweed							10	10						5			
Jussiaea repens	Primrose Willow								25	35				20		10		
Polygonum hydropiperoides	Wild Water Pepper									1					5			
Typha latifolia	Cattail										20					15	35	35
Asclepias incarnata	Swamp Milkweed																3	
Bidens sp.	Beggartick																1	
Alisma plantago-aquatica	Water Plaintain																1	
Saggitaria engelmanniana	Arrowhead																3	
Amorpha fruiticosa	False Indigo																	40
Salix nigra	Black Willow																	35
Cephalanthus occidentalis	Buttonbush																	10
% Space		20	20	20	10	15	10	15	5	15	5	0	0	10	10	10	10	5

Table VI-13 Marsh 5, Transect 1. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments							
		1	2	3	4	5	6	7	8
Lemna minor	Duckweed	25	25	30	30	35	45	50	
Nelumbo lutea	Water Lotus		25	25		40	50	20	
Utricularia gibba	Bladderwort		10	10			5	5	
Salix nigra	Black Willow			10			5	3	
Spirodela polyrhiza	Big Duckweed					1	5		
Graminae sp.	Grass						15	25	25
Typha latifolia	Cattail							25	20
Cehalanthus occidentalis	Buttonbush							10	35
Polygonum coccineum	Water Smartweed							1	
Polygonum hydropiperoides	Wild Water Pepper								20
Sagittaria engelmanniana	Arrowhead								10
Sium suave	Water Parsley								15
Jussiaea repens	Primrose Willow								5
% Space		75	50	45	70	20	10	5	0

Table VI-14

Marsh 5, Transect 2. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments							
		1	2	3	4	5	6	7	8
Lemna minor	Duckweed	45	40	20	20	25	60	75	15
Nuphar advena	Spatterdock	20	55	65	65	65	25	5	
Graminae sp.	Grass						25		25
Polygonum coccineum	Water Smartweed						10		
Salix nigra	Black Willow							25	20
Cephalanthus occidentalis	Buttonbush							20	25
Sagittaria engelmanniana	Arrowhead							15	15
Bidens sp.	Beggartick							5	
Sium suave	Water Parsley								10
Acer saccharinum	Silver Maple								10
% Space		55	25	20	20	15	5	5	5

Table VI-15

Marsh 5, Transect 3. Percent cover in consecutive 10 foot transect segments, each segment 3 x 10 feet. Segment 1 was the center of open water and the last segment was on land.

Binomial	Common Name	Transect Segments																						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
Lemna minor	Duckweed	25	20	20	15	20	50	50	50	25	30	95	98	95	95	80	15	30	25	30	20			
Salix nigra	Black Willow		7	5																	5		40	
Polygonum coccineum	Water Smartweed		5		5	30			1											3				
Typha latifolia	Cattail				15			15		15		15	45	50	15	30								
Utricularia gibba	Bladderwort						10																	
Sagittaria engelmanniana	Arrowhead							5		3		35	10	25	15	30	10	7	3		10	25		
Jussiaea repens	Primrose Willow																				45	30	10	
Polygonum hydropiperoides	Wild Water Pepper																				5	45	10	
Graminae sp.	Grass																						40	
% Space		75	75	75	70	50	50	45	50	70	70	5	2	2	10	15	75	70	80	70	30	0	10	

Transect 3 was 220 feet in length. The transect represented a shallow area extending to an "island" in the middle of the lake. The vegetation represents aquatic and marsh species interspersed and it does not present a classical succession pattern. The "island" region was dominated by willow, arrowhead, primrose willow, wild water pepper, and grass and it was covered by water during wetter parts of the year.

The wetland habitats sampled were rather different from one another. Marsh 1 had a rather large body of open water which was rather shallow and filled with saplings of willow and cottonwood. It is presumed that summer drought periods have been sufficient to deplete the water and to permit the germination and establishment of tree seedlings and saplings. Tree species were also present (and probably originated similarly) in Marshes 2 and 5 (McDonough Lake). Marsh 1 is rather protected by surrounding forest and it was found that large wading birds abound there. During the period of research observation, approximately three dozen large birds, including great blue herons, small green herons, egrets, and several other species were found utilizing the habitat there. This marsh is evidently an important area to the existence of large wading birds. Marsh 3 was on the shoreline of Horseshoe Lake and a large embayment at the northeast end. The transects were taken where the vegetation was well developed and are not necessarily characteristic of the lake in general. Marsh 4 was represented by two small man-made lakes north of Edelhardt Lake and the steeper nature of these resulted in narrower zones of succession than were observed in the broader, shallower marshes of the other sites.

General Discussion

In general, succession proceeded from open water to willow-cottonwood forest, with zones of successional stages distributed in concentric fashion from the water body to the surrounding cultivated fields.

Deeper open water areas contained bladderwort beneath the surface and duckweed, big duckweed, or ricciocarpus at the surface. Shallower open water areas were characterized by water lotus, spatterdock, primrose willow, duckweed, big duckweed, or ricciocarpus. Wet soil next to the water was characterized by wild water pepper, water plantain, arrowhead, fog fruit, water smartweed, grasses, or sedges. The next zone was characterized by rose mallow, cattail, water parsley, spotted touch-me-not, or nettle. The shrub zone was characterized by buttonbush, false indigo, saplings of black willow, or saplings of cottonwood. The tree zone was characterized by willow, silver maple, and cottonwood with black cherry, persimmon, elm, and other species mixed in. The weedy area between trees and corn/soybean fields contained ragweeds, goldenrod, cocklebur, pigweed, and lambs quarters.

PHYTOPLANKTON

Procedure

Samples were taken at twenty sites during the period August 13-20, 1978, and again during the period November 20-24, 1978. The first set of samples was taken in warm, sunny weather with the sites at low-flow. The second set was taken during a period of rainy, cold weather and most sites had considerably higher flow than before. Sites are described in Table V-2 of this Environmental Inventory Report.

Samples were taken as nearly as possible from the middle of the stream. They were stored and transported in clean glass jars and kept under refrigeration until examination. All samples were examined within twenty-four hours of collection.

Counting procedure began with placing two tenths ml of a sample on an ordinary glass slide and covering this with a square glass cover slip. The sample was scanned under low power (X100) using high dry (X450) when more magnification was needed for positive identification. Each individual or colony found represented one count. For example, each Scenedesmus coenobium contains four cells but was counted as one Scenedesmus. Samples with population densities too high to be easily counted were first diluted with buffered water. Numbers obtained by this procedure were multiplied by an appropriate factor to yield individuals per liter. This procedure allowed greater accuracy in identification and enumeration than that obtained using a hemocytometer or Sedgewick-Rafter counting slide. In accordance with the scope of work, diatoms were not identified or counted.

All organisms were identified using Smith (1950), Whitford and Schumacher (1973), and Wicks (1978).

Results

The following data are divided into two parts. Table VI-16 is the occurence of species by sampling site in two sampling periods. Numbers following each species binomial indicate in how many sites that species occurred on the first (8/20/78) and second (11/22/78) sampling dates. Table VI-17 presents the species and their numbers by site. Figures following each species binomial represent numbers of individuals

Table VI-16

Occurrence of Species of Algae Observed
on Two Sampling Dates in 20 Sites*

Species	Occurrence (Number of Sites) 8/20/78	11/22/78
Green Algae		
Actinastrum hantzchii	8	0
Ankistrodesmus falcatus	15	13
Arthrodesmus validus	5	1
Chlamydomonas sp.	14	17
Coelastrum microporum	4	2
Coelastrum reticulatum	10	2
Cosmarium sp.	5	2
Crucigenia quadrata	3	0
Dictyosphaerium pulchellum	1	0
Golenkinia radiata	7	4
Micractinium pusillum	10	3
Oocystis lacustris	3	0
Pediastrum duplex	2	0
Polydriopsis spinulosa	1	0
Scenedesmus acuminatus	6	8
Scenedesmus quadricauda	12	5
Tetraedron quadricuspidatum	1	0
Tetraedron trigonum	3	0
Tetrastrum staurogeniaeforme	1	1
Treubaria triappendiculata	4	0
Euglenoids		
Euglena sp.	10	9
Phacus sp.	0	1
Trachelomonas hispida	4	0
Trachelomonas volvacina	3	2
Golden Brown Algae		
Centritractus belanophorus	3	1
Ophiocytium capitatum	3	0
Tribonema bombycinum	4	1

*The sites are described in Table V-2.

Table VI-16 (cont.)

Species	Occurrence (Number of Sites) 8/20/78	11/22/78
Blue Green Algae		
Agmenellum quadriduplicatum	6	0
Anacystis marina	3	0
Calothrix parientina	5	2
Coccochloris sp.	17	10
Oscillatoria submembranacea	13	18
Spirulina subsalsa	7	3
Stigonema sp.	0	1
Miscellaneous		
Cryptomonas sp.	0	1
Total Species	32	22

Table VI-17

Number of Individuals per Algal Species by Site

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
	Site 1	
Green Algae		
Actinastrum hantzchii	15	---
Ankistrodesmus falcatus	120	1.0
Arthrodesmus validus	15	---
Chlamydomonas sp.	---	2.0
Coelastrum reticulatum	20	---
Crucigenia quadrata	10	---
Micractinium pusillum	25	---
Scenedesmus quadricauda	45	---
Euglenoids		
Euglena sp.	15	2.0
Phacus sp.	---	5.0
Trachelomonas volvacine	---	1.0
Blue Green Algae		
Agmenellum quadriduplicatum	5.0	---
Coccochloris sp.	140	---
Oscillatoria submembranacea	30	4.0
Miscellaneous		
Cryptomonas sp.	---	2.0
Total Number of Individuals	440	17
Number of species at site	11	7
Percent of total species	34	32
	Site 2	
Green Algae		
Ankistrodesmus falcatus	15	360
Chlamydomonas sp.	---	100
Scenedesmus acuminatus	5.0	40
Tetraedron trigonum	10	---
Euglenoids		
Euglena sp.	20	---

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Blue Green Algae		
Calothrix parientina	350	100
Coccochloris sp.	15	40
Oscillatoria submembranacea	155	1400
Spirulina subsalsa	45	140
Total number of individuals	648	2219
Number of species at site	8	7
Percent of total species	25	32
Site 3		
Green Algae		
Actinastrum hantzchii	20	---
Ankistordesmus falcatus	35	840
Arthrodesmus validus	25	---
Chlamydomonas globosa	5.0	60
Coelastrum microporum	20	---
Coelastrum reticulatum	5.0	---
Golenkinia radiata	5.0	---
Micractinium pusillum	15	---
Scenedesmus acuminatus	---	60
Tetraedron trigonum	5.0	---
Euglenoids		
Euglena sp.	105	---
Blue Green Algae		
Agmenellum quadriduplicatum	60	---
Calothrix parientina	2500	330
Coccochloris sp.	85	60
Oscillatoria submembranacea	320	1650
Spirulina subsalsa	250	330
Golden Brown Algae		
Tribonema bombycinum	10	---
Total number of individuals	3465	3330
Number of species at site	16	7
Percent of total species	50	32

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 4		
Green Algae		
Ankistrodesmus falcatus	5.5	1.5
Chlamydomonas globosa	1.5	0.5
Cosmarium sp.	2.0	0.5
Euglenoids		
Euglena sp.	2.5	---
Trachelomonas hispida	0.5	---
Blue Green Algae		
Coccochloris sp.	---	6.5
Oscillatoria submembranacea	4.5	2.5
Total number of individuals	16.5	11.5
Number of species at site	6	5
Percent of total species	19	23
Site 5		
Green Algae		
Ankistrodesmus falcatus	3.5	---
Chlamydomonas globosa	2.0	1.5
Coelastrum microporum	---	1.5
Euglenoids		
Euglena sp.	2.5	---
Blue Green Algae		
Coccochloris sp.	1.5	---
Oscillatoria submembranacea	0.5	1.0
Total number of individuals	10.0	4.0
Number of species at site	5	3
Percent of total species	16	14

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 6		
Green Algae		
Actinastrum hantzchii	5.0	---
Ankistrodesmus falcatus	35	1.5
Chlamydomonas glogosa	5.0	1.5
Scenedesmus quadricauda	5.0	---
Euglenoids		
Euglena sp.	5.0	---
Golden Brown Algae		
Ophiocytium capitatum	25	---
Blue Green Algae		
Coccochloris sp.	95	4.5
Oscillatoria submembranacea	10	4.5
Spirulina subsalsa	1.0	---
Total number of individuals	186	11.5
Number of species at site	9	4
Percent of total species	16	14
Site 7		
Green Algae		
Chlamydomonas globosa	0.5	---
Euglenoids		
Euglena sp.	1.5	---
Blue Green Algae		
Coccochloris sp.	1.0	2.0
Oscillatoria submembranacea	---	2.0
Stigonema sp.	---	2.0
Total number of individuals	3.0	6.0
Number of species at site	3	3
Percent of total species	9	14

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 8		
Green Algae		
Chlamydomonas globosa	1.0	---
Scenedesmus quadricauda	0.5	---
Euglenoids		
Euglena sp.	2.5	0.5
Blue Green Algae		
Coccochloris sp.	4.0	0.5
Oscillatoria submembranacea	1.0	1.5
Total number of individuals	9.0	2.5
Number of species at site	5	3
Percent of total species	16	14
Site 9		
Green Algae		
Ankistrodesmus falcatus	10	2.0
Chlamydomonas globosa	20	135
Coelastrum reticulatum	10	---
Cosmarium sp.	5.0	---
Golenkinia radiata	5.0	---
Micractinium pusillum	15	---
Scenedesmus quadricauda	10	---
Euglenoids		
Euglena sp.	---	38
Trachelomonas volvacina	10	39
Golden Brown Algae		
Tribonema bombycinum	5.0	---
Blue Green Algae		
Agmenellum quadriduplicatum	5.0	---
Coccochloris sp.	250	---
Oscillatoria submembranacea	10	5.0
Total number of individuals	355	219
Number of species at site	12	5

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Percent of total species	37	23
Site 10		
Green Algae		
Chlamydomonas sp.	8.0	2.5
Euglenids		
Euglena sp.	---	1.0
Trachelomonas volvacine	0.5	---
Blue Green Algae		
Coccochloris sp.	2.5	---
Oscillatoria submembranacea	12	2.0
Total number of individuals	23	5.5
Number of species at site	4	3
Percent of total species	12	14
Site 11		
Green Algae		
Ankistrodesmus falcatus	75	80
Chlamydomonas sp.	10	25
Coelastrum reticulatum	30	25
Cosmarium sp.	---	---
Golenkinia radiata	30	15
Micractinium pusillum	5.0	10
Pediastrum duplex	10	---
Scenedesmus acuminatus	10	15
Scenedesmus quadricauda	5.0	---
Treubaria triappendiculata	10	---
Euglenoids		
Trachelomonas volvacina	5.0	---
Blue Gree Algae		
Agmenellum quadriduplicatum	80	---
Coccochloris sp.	285	40
Oscillatoria submembranacea	525	25
Spirulina subsalsa	170	---

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Total number of individuals	1250	225
Number of species at site	14	8
Percent of total species	44	36
Site 12		
Green Algae		
Actinastrum hantzchii	1.0	---
Ankistrodesmus falcatus	18	1.5
Chlamydomonas sp.	1.0	5.0
Coelastrum microporum	5.0	---
Cosmarium sp.	11	---
Golenkinia radiata	13	---
Micractinium pusillum	7.0	---
Scenedesmus acuminatus	2.0	---
Scenedesmus quadricauda	15	---
Tetrastrum staurogeniaforme	3.0	---
Euglenoids		
Euglena sp.	5.0	7.0
Trachelomonas hispida	2.0	---
Golden Brown Algae		
Centritractus belanophorus	2.0	---
Ophiocytium capitatum	1.0	---
Blue Green Algae		
Agmenellum quadriduplicatum	2.0	---
Anacystis marina	4.0	---
Coccochloris sp.	36	---
Oscillatoria submembranacea	---	6.0
Spirulina subsalsa	2.0	---
Total number of individuals	130	19.5
Number of species at site	18	4
Percent of total species	56	18

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 13		
Green Algae		
Actinastrum hantzchii	5.0	---
Ankistrodesmus falcatus	70	0.5
Arthrodesmus validus	10	---
Chlamydomonas globosa	25	---
Coelastrum microporum	10	---
Coelastrum reticulatum	55	---
Crucigenia quadrata	15	---
Dictyosphaerium pulchellum	10	---
Golenkinia radiata	5.0	---
Scenedesmus acuminatus	20	---
Scenedesmus quadricauda	70	0.5
Tetraedron quadricuspidatum	5.0	---
Treubaria triappendiculata	35	---
Golden Brown Algae		
Centritractus belanophorus	5.0	0.5
Ophiocytium capitatum	20	---
Blue Green Algae		
Agmenellum quadriduplicatum	50	---
Coccochloris sp.	160	2.5
Oscillatoria submembranacea	625	1.5
Spirulina subsalsa	55	0.5
Total number of individuals	1250	6.0
Number of species at site	19	6
Percent of total species	59	27
Site 14		
Green Algae		
Ankistrodesmus falcatus	1.5	---
Chlamydomonas globosa	4.0	2.0
Golenkinia radiata	1.0	---
Euglenoids		
Euglena sp.	0.5	---

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Blue Green Algae		
Oscillatoria submembranacea	---	1.0
Total number of individuals	7.0	3.0
Number of species at site	4	2
Percent of total species	12	9
Site 15		
Green Algae		
Actinostrum hantzchii	30	---
Ankistrodesmus falcatus	385	20
Arthrodesmus validus	---	30
Chlamydomonas globosa	25	25
Coelastrum reticulatum	55	10
Cosmarium sp.	45	---
Golenkinia radiata	---	5.0
Micractinium pusillum	20	5.0
Oocystis lacustris	20	---
Scenedesmus acuminatus	20	80
Scenedesmus quadricauda	30	10
Treubaria triappendiculata	5.0	---
Euglenoids		
Euglena sp.	---	15
Trachelomonas hispida	35	---
Blue Green Algae		
Calothrix parientina	85	---
Coccochloris sp.	170	5.0
Oscillatoria submembranacea	---	50
Spirulina subsalsa	5.0	---
Total number of individuals	930	255
Number of species at site	14	11
Percent of total species	44	50

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 16		
Green Algae		
Ankistrodesmus falcatus	275	---
Chlamydomonas sp.	20	20
Coelastrum reticulatum	90	---
Cosmarium sp.	5.0	---
Golenkinia radiata	40	---
Micractinium pusillum	5.0	---
Oocystis lacustris	5.0	---
Polydriopsis spinulosa	5.0	---
Scenedesmus acuminatus	35	65
Scenedesmus quadricauda	65	---
Staurastrum paradoxum	5.0	---
Treubaria triappendiculata	5.0	---
Euglenoids		
Euglena sp.	---	15
Trachelomonas hispida	10	---
Blue Green Algae		
Calithrix parientina	95	---
Coccochloris sp.	70	---
Oscillatoria submembranacea	---	35
Total number of individuals	730	135
Number of species at site	15	4
Percent of total species	47	18
Site 17		
Green Algae		
Ankistrodesmus falcatus	200	10
Chlamydomonas sp.	---	45
Coelastrum reticulatum	15	---
Micractinium pusillum	15	---
Scenedesmus acuminatus	---	35
Scenedesmus quadricauda	10	5.0

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Euglenoids		
Euglena sp.	---	35
Blue Green Algae		
Calothrix parientina	50	---
Coccochloris sp.	195	---
Oscillatoria submembranacea	---	10
Total number of individuals	485	140
Number of species at site	6	6
Percent of total species	19	27
Site 18		
Green Algae		
Ankistrodesmus falcatus	5.0	---
Chlamydomonas sp.	---	25
Coelastrum reticulatum	5.0	---
Crucigenia quadrata	5.0	---
Golenkinia radiata	---	5.0
Micractinium pusillum	5.0	5.0
Oocystis lacustris	5.0	---
Scenedesmus acuminatus	---	5.0
Scenedesmus quadricauda	15	---
Euglenoids		
Euglena sp.	---	1.0
Golden Brown Algae		
Centritractus belanophorus	5.0	---
Tribonema bombycinum	35	---
Blue Green Algae		
Oscillatoria submembranacea	10	5.0
Total number of individuals	90	46
Number of species at site	9	6
Percent of total species	28	27

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Site 19		
Green Algae		
Actinastrum hantzchii	10	---
Ankistrodesmus falcatus	---	5.0
Arthrodesmus validus	10	---
Chlamydomonas sp.	5.0	10
Coelastrum reticulatum	5.0	10
Golenkinia radiata	---	5.0
Micractinium pusillum	5.0	---
Scenedesmus acuminatus	---	5.0
Scenedesmus quadricauda	---	5.0
Tetrastrum staurogeniaeforme	---	5.0
Golden Brown Algae		
Tribonema bombycinum	---	20
Blue Green Algae		
Anacystis marina	5.0	---
Coccochloris sp.	10	---
Total number of individuals	50	60
Number of species at site	7	8
Percent of total species	22	36
Site 20		
Green Algae		
Actinastrum hantzchii	2.5	---
Ankistrodesmus validus	---	10
Arthrodesmus validus	2.5	---
Chlamydomonas sp.	---	10
Coelastrum microporum	7.5	5.0
Pediastrum duplex	2.5	---
Scenedesmus quadricauda	5.0	5.0
Tetraedron trigonum	2.5	---
Golden Brown Algae		
Tribonema bombycinum	17.5	---

Table VI-17 (cont.)

Species	Number of individuals X 10^4 per liter 8/20/78	11/22/78
Blue Green Algae		
Anacystis marina	2.5	---
Coccochloris sp.	15	5.0
Oscillatoria submembranacea	2.5	---
Total number of individuals	60	35
Number of species at site	10	5
Percent of total species	31	23

times 10^4 per liter of water. Total number of individuals is the sum of all species counts and is also expressed as numbers of individuals times 10^4 per liter. Number of species at site represents how many distinct species were present. Percent of total species related the number of species found at that site to the total number found for that particular survey period. Thus at site 7, although there were three species for both sample periods, the total number of species from Table VI-16 differed and resulted in different percentages.

Discussion in Relation to Water Quality

Table VI-16 shows that, from the first to the second sampling period, most species decreased in occurrence. This decrease was most likely caused by the change in season and the change in water quality and quantity due to storm runoff. Of the six species that increased in occurrence, three were found only once on the second survey while the remaining three are rather common.

Table VI-17 shows that most sites declined in total numbers and percent of total species, a few sites stayed more or less even, and site 2 actually increased. To facilitate discussion, population sizes can be broken into five groups. These groups are as follows: (1) sites with consistently sparse populations, (2) sites with consistently moderate populations, (3) the site with consistently high population , (4) the site in which population density rose, (5) sites in which population density dropped.

(1) Sites with consistently sparse populations.

This group includes sites 5, 7, 8, and 14 which were feeder streams from the bluff, sites 18, 19, and 20 which were consecutive

sites on the Chain of Rocks Canal, and sites 4 and 10.

The bluff feeder streams were swift-running with clay or gravel beds. Ammonia, nitrate, and pH increased and phosphates decreased in each of them yet lack of quiet pools for phytoplankton development is probably the main reason for sparse populations. Values for ammonia, nitrate, phosphates, pH, and other water quality measures were not different enough to suggest the variation in population observed between sites of sparse and high densities.

Sites along the Chain of Rocks Canal were quite similar. Nitrogen and phosphorus levels, which sometimes limit growth of algae, increased but only site 19 had a slight increase in population. Once again the turbulent motion of the water probably prevented extensive phytoplankton development.

Site 4 resembled the bluff feeder streams. Water quality was not significantly different from dense population sites. Habitat for phytoplankton development was limited. Water samples taken during the second sample period showed the presence of chlordane and mercury. The effects of these substances on the algae is unknown. However, the stability of the population suggests that their effects were minimal.

On the first sampling, site 10 was a series of unconnected shallow pools. The quiet pools and adequate nutrients should have fostered a dense population. However, the presence of a population composed solely of flagellate algae and cyanophyta suggests that only the most tolerant forms could survive. These pools were shallow and exposed to intense sunlight. Natural ultraviolet light is known to inhibit plankton growth in the top few centimeters of water. The shallow pools

provided little habitat adequately screened from the intense light. Dilution of this limited population with stream runoff could easily account for the lower population found in the November survey.

(2) Site with consistently moderate populations.

This group includes all sites on the Cahokia Diversion Canal as well as site 9 near the head of Cahokia Canal.

Sites on the Diversion Canal were closely related. The waterway was deep and sluggish on the first collection. This lack of turbulence would help to explain the development of an extensive phytoplankton. Certainly there were sufficient levels of fixed nitrogen and phosphorus to support such growth. By the time of the second collection, ammonia and nitrate levels had increased, yet the algal population was not only reduced but also altered in composition. Dilution and increased turbulence due to runoff could account for this drop. Chlordane was present at these sites during the second collection and it is possible that it could have affected the populations although its effects on algae are unknown.

Site 9 near the head of Cahokia Canal was wide and sluggish having no apparent movement during either visit. Levels of ammonia, nitrate and phosphates increased. Phosphates were the highest of any site on either survey. By the November collection the population had declined in species present. However, flagellated algae increased greatly, so that actual numbers showed only a slight decrease. High levels of phosphates probably favored this increase in flagellates.

(3) The site with consistently high population.

Site 3 represents the overflow from Horseshoe Lake. This lake is shallow and highly eutrophic, an ideal place for phytoplankton growth. Although water quality conditions may vary, favoring one species over another, the general density of population probably changes rather slowly. Thus even though the volume of water may fluctuate, the units per volume do not. Table VI-17 shows that diversity decreased yet almost all those species that remained had dramatic increases in population. The increase of mercury or more likely the decrease of phosphates could have influenced the shift in population composition. The number of individuals was approximately the same on both dates.

(4) The site whose population density rose.

Site 2 is directly downstream from the confluence of the Horseshoe Lake outfall and Cahokia Canal. Table VI-17 shows that its population is more closely related to the outfall than to the next upstream canal site (site 4). This resulted from the densely populated water of the lake mixing with the sparsely populated canal. When there was little flow from the lake on the first survey the dense lake population was diluted. On the second survey, runoff had increased the proportion of water entering from the lake and the population of site 2 rose.

(5) Sites whose population density dropped.

Sites 1, 6, 11, 12, and 13 dropped in population from one population size class to another. All of these sites except 11 had an increase in mercury which could have affected their populations.

Sites 1 and 6 on the Cahokia Canal showed a drop in diversity and numbers which could be expected from seasonal changes in weather and flow. Site 11, Long Lake, owed most of its population during the first collection to a bloom of several species of blue-greens. Site 12, a feeder stream to Horseshoe Lake, showed a large decrease in diversity and population. Site 13, Nameoki Ditch, experienced a similar decrease. All of these decreases occurred regardless of whether ammonia, nitrate and phosphate levels increased or decreased. Once again season and increasing amounts of runoff water were probably critical factors influencing population decline.

Concentrations of fixed nitrogen or phosphorus probably did not limit the development of any population. The effects of mercury and chlorinated hydrocarbons at the levels found are speculative. Throughout the survey area, when physical conditions favored extensive growth, dense populations appeared. As a general rule water quality determined what species would prevail while the physical environment (flow, turbulence, type of stream bed, etc.) determined the extent to which the population could develop.

Dominant Species

Dominant species (100 X 10^4 per liter or greater) during the first collection data were Ankistrodesmus falcatus and Coccochloris sp. in site 1; Calothrix parietina and Oscillatoria submembranacea in site 2; Calothrix parietina in site 3; Coccochloris sp. in site 6; Coccochloris sp. in site 9; Oscillatoria submembranacea, Coccochloris sp., and Spirulina subsalsa in site 11; Oscillatoria submembranacea and Coccochloris sp. in site 13; Ankistrodesmus

falcatus and Coccochloris sp. in site 15; Ankistrodesmus falcatus in site 1′ and Ankistrodesmus falcatus and Coccochloris sp. in site 17. Aquatic systems undergo succession from oligotrophic to eutrophic, to highly eutrophic environmental conditions and consequent populations of phytoplankton. On this basis, the general conclusion to be derived is that where populations were more than sparse, the bodies of water were either eutrophic or highly eutrophic in nature (sites 1, 2, 3, 6, 9, 11, 13, 15, 16, 17).

This suggests a biological quality of water which produces, over the course of time, large numbers of algae, high nutrient levels, and low oxygen levels at times. The trend is from light biological productivity (of tolerant organisms) to gradual stagnation with a final lowering of biological diversity and then productivity. As indicated by algae, therefore, the sampling sites suggest later stages of succession and a tendency in the direction of mature aquatic ecosystems. This does not indicate very good water conditions either now or in the future. Agricultural runoff, yard runoff, lake outflow, and sewage effluent probably contribute nutrients and sediments, and to a lesser degree pesticides, to the sampling sites. Septic systems and cesspools free nutrients, both organic and inorganic, from the total or partial mineralization of sewage. Such sewage and its nutrients are spread more readily at times of increased flooding and runoff, as are soil surface nutrients. Seasons of the year probably affect the nutrients of the water, there being considerable runoff into Cahokia Canal following winter/spring flooding and little or no runoff during the dry period of summer/fall. Severe rains

probably increase the input of nutrients into Cahokia Canal regardless of when they occur in relation to general seasonal trends. Most of the runoff and flooding occur during the cooler part of the year, whereas the greatest growth of phytoplankton generally takes place when nutrients (especially nitrates and phosphates) and temperatures are high. Although flooding increases nutrients, it generally occurs at a time when temperatures are not optimal. In any event, some of the algal species which were found are indicators of eutrophic or highly eutrophic conditions. These conditions are exacerbated by nutrients originating from such sources as runoff, animal wastes, human sewage, and lake outflows. With additional area development, the quality of aquatic populations of algae and the quality of the water can be expected to remain as eutrophic as now or to become increasingly more eutrophic.

In an October, 1979, study of the Edwardsville sewage lagoon, Britsch found phytoplankton populations of approximately 6×10^8 individuals per liter. There is no equivocating possible about the highly eutrophic nature of this lagoon, and this lagoon may be considered to represent optimal environmental conditions for algal growth in non-laboratory conditions. The number of phytoplankton per liter in the lagoon, therefore, may represent a maximum standard against which to compare populations found in the study reported herein. The highest number of individuals found in the Cahokia Canal study area was approximately 3.5×10^7 in site 3 on both sampling dates. Other high populations in relation to the sewage lagoon included, on 8/28/78, sites 2, 11, 13, 15, and 16 with approximately

1×10^7 individuals per liter and, on 11/22/78, site 2 with approximately 2×10^7 individuals per liter. The sites, therefore, with approximately one twentieth to one sixtieth of the population of the sewage lagoon, included sites 2 and 3 south of Horseshoe Lake, site 11 on Long Lake, site 13 at Nameoki Ditch, and sites 15 and 16 on Cahokia Diversion Channel. No consistent factors, such as water quality characteristics or sewage effluent inputs could be found to correlate with population sizes except possibly that nutrients, especially nitrate and phosphate, were sufficient and that still water existed - it has been demonstrated that algae will not generally tolerate considerable water movement, either in streams or in laboratory culture shakers. The tentative conclusion follows, from this, that highly eutrophic conditions exist and that lack of water flow may cause the development of high populations of algae.

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SECTION VII

BIOLOGICAL ELEMENTS
ZOOPLANKTON AND BENTHOS

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ZOOPLANKTON

Materials and Methods

Two sets of zooplankton samples were collected from each of the twenty designated sampling stations. (The sites are described in Table V-2). The first set from sites 1 through 16 was taken between July 11 and July 21, 1978, the second set on September 12, 1978. Sites 18, 19, and 20 were sampled on September 13 and 14, 1978 and again on November 13. Each sample consisted of thirty liters of water collected in ten liter amounts from each of three representative habitats at the site. The plankton were concentrated by pouring the water through a No. 20 Wisconsin Style Plankton Net Sampler, washed into a wide mouth glass jar, and fixed with an equal volume of neutralized ten per cent formalin containing Rose Bengal stain.

In the laboratory, each sample was washed thoroughly into a 100 ml graduated cylinder. After the contained organisms had settled to the bottom, fluid was decanted from the top until thirty ml remained (one ml representing one liter of filtered water sample). The sample was then automatic pipetted and placed in a Wards Zooplankton Counting Wheel (Wildco). Three one ml samples were counted unless few zooplanters were present in which case two to nine additional ml of sample were added to the orignal one ml. The entire sample was counted where organisms were very few. Samples from sites 1 and 2 were counted in one tenth ml aliquots because of the large number of plankters present. Specimens of rotifers and crustacea not familiar to the identifier were mounted in Hoyer's Medium for microscopic

examination and identification.

All samples were collected by Donal Myer with the assistance of Thomas Keevin. Further processing, identification and counting was done by Donal Myer. Identifications were made to the lowest taxon practicable, usually genus or species, using primarily the following references: Ahlstrom (1940), Edmondson (1959), and Pennak (1953).

Results and Discussion

Tables VII-1 and VII-2 are composite lists of the zooplankton found at sites 1 through 17 during the first (July) and second (September) sampling periods, respectively; and of the zooplankton at sites 18 through 20 during the first (September) and second (November) collection periods, respectively. Calanoid copepodids, cyclopoid copepodids, and nauplii were counted as separate taxa in the composite list and in computations, due to the fact that these forms often occupy niches separate from the adults of the species.

Three major planktonic groups: Rotifera, Cladocera, and Copepoda, and two minor groups: the Nematoda and Insecta, were recovered during this study. Thirty-eight (fifty-eight per cent) of the sixty-five zooplankton taxa found in July at sites 1-17 were Rotifera, fourteen (twenty-one per cent) taxa were Cladocera, while thirteen (twenty per cent) were Copepoda. Of the fifty-seven taxa found in September, thirty-four (sixty per cent), eleven (nineteen per cent), and eleven (nineteen per cent) were Rotifera, Cladocera and Copepoda, respectively.

The average number of plankton taxa present per site was twenty-two in July, nineteen in September. The range was eleven to thirty-six

Table VII-1

ZOOPLANKTON

#/Liter July, 1978
(Except # 18-20, September, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rotifera																				
Asplanchna	20	12	43	13	1	27	+	+	96		14						1	+	+	+
Brachionus angularis		48	98	30	4	108	1	5	1		2	1		+	1	+	+	+	+	
B. bidentata				4	+	1	+		1	97	3	18	4	+	3	13	27	2		
B. budapestinensis																		1	2	3
B. calyciflorus	1455	618	26	+	1	2	+	+	2	1	1	3			+		27	6	3	2
B. caudatus	70	106	34	+	1	1			6	+	24	1		+	+				+	
B. havanaensis	75	16	70	15	1	24		+			+	2	+	+	+	1	3			
B. quadridentatus			4	1					3	1	1	29	6		5	68	67	1	+	+
B. urceolaris	15										+					+		2	+	+
Cephalodella						2		+	1	3			1	1	2	+	+	1		
Collotheca	5	12	1	+		1					1							4	3	1
Conochiloides																		+		
Conochilus hippocrepis									+											
Euchlanis				1	+	1		+	+	1		3	+		+	+	1			
Filinia longiseta	85	112	24	13	5	17		+	28		80	1		+	+	1	2			
Hexarthra (Pedalia)						3			1										4	6
Keratella cochlearis		2		2	+	15		+			1	1			+		1	+	1	1
K. quadrata		1	2				+	+							+	+				
Lecane #1			1		+	1			4	20	1	6	19	+	1	1	1			
Lecane #2					+															
Lecane #3															+					
Lepadella												2	+							
Monostyla 1					+	+			4											
Monostyla 2												3								
Monostyla quadridentata					+				+			1	+							
Mytilina						+			1				+							
Nothalca														+	+	+	+			
Platyias patulus			4	4	2	9			42	17	1	10	3	+	1	4	6			
P. quadricornus									1						+					
Polyarthra			9	12	+	3			28	1	152				1	1	1	3	7	9

+ Less than .6 per liter (and not counted in tally of Total Number of Individuals/Liter)

Table VII-1 (con't)

ZOOPLANKTON

#/Liter July, 1978
(Except #18-20, September, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rotatoria neptunia									1											
Synchaeta				+					2											
Testudinella												3	+		+	2				
Trichocera									+									1		+
Unknown #1	115	70	1	3	1	4		+	2	1	3	1	9	+	+	6	2			
Unknown #2													2				1			
Unknown #3																		10	15	15
Unknown #4										+										
Unknown #5											1				+					
Unknown #6																	1			
Unknown #7																	+			
Cladocera																				
Alona rectangula									8					+						
Bosmina coregoni				3										+						
B. longirostris	17	11	255		+	1	+				+						+	1	1	14
Ceriodaphnia megalops												+								
Chydorus sphaericus									1		1	1								
Daphnia parvula																			+	
Daphnia sp.														+						
Diaphanosoma brachyurum	7	3	2	8	+	9		+			10	+				+	+	+	+	2
Moina affinis							+	+									+			
Moina micrura	2		2	+					1		15		+	+		+		1	3	15
Pleuroxus denticulatus					+				12	+										
P. trigonellus					+				+											
Scapholebris kingi						+						1					+			
Simocephalus												+								
Unknown Cladocera #1						+														

+ Less than .6 per liter (and not counted in tally of Total Number of Individuals/Liter)

Table VII-1 (con't)

ZOOPLANKTON

#/Liter July, 1978

(Except #18-20, September, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Copepoda																				
Diaptomus pallidus						+								+			+			
D. sicilloides	37	47	19	+		2			+		4	+						+		
Calanoid copepodids	39	9	15	1	+	1	+				14							+	+	+
Cyclops varicans rub.				+	+				5				+			+				
C. vernalis	18	11	20		+		+	+	+	1	2				+	+		2	2	2
Eucyclops agilis									+			+		+	+	+	+			
Ectocyclops phaleratus									+											
Macrocyclops albidus									+			+		+						
Mesocyclops														+						
Paracyclops fimbriatus puppei					+				+			+	+	+		+				
Unknown Cyclopoid # 1				+		+														
Cyclopoid copepodids	11	6	59	2	+	2	+		9	2	29	4	2	+	+	1	10	5	10	10
Nauplii	91	116	131	13	11	29	+	+	18	5	68	25	3	1	5	29	89	15	30	27
Nematoda						+			+				1							
Total Number of Species	16	17	21	24	27	29	11	14	35	15	25	28	19	21	24	23	26	21	20	18
Total Number of Individuals/Liter	2062	1200	820	126+	27+	263+	1+	5+	278+	150+	428+	117+	50+	3+	17+	127+	241+	54+	81+	107

+ Less than .6 per liter (and not counted in tally of Total Number of Individuals/Liter)

ZOOPLANKTON

Table VII-2 #/Liter September, 1978 (Except #18-20, November, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Rotifera																				
Asplanchna			17	+	+	5			2	14	31			+	10	18	2	3	+	1
Brachionus angularis			1	1		1		1	2	227	10		153				134	2	1	2
B. bidentata	1			+		390	1			12	1	+	+	+	72	18	8			
B. budapestinensis										16			181	5		12	32			1
B. calyciflorus	12	4	159	1	+	57				147	50	12	21	2	9	31	44	23	19	26
B. caudatus	1	+		7		12					61	1		1		2	22			
B. havanaensis			1			1		1	4			1	1							
B. plicatilis									2											
B. quadridentatus	+	1	5	+		2		3	74		7	1	1		25	26	3	2	2	1
B. rubens	1					70								3						
B. urceolaris	5	1	8							2	2				33	20	4	1	+	1
Cephalodella	+			+	+					6		2		5						
Collotheca	2		2	+						1	6						+		1	1
Conochilus hippocrepis (colonies)								1	16											
Epiphanes	+																			
Euchlanis			1		1											7				
Filinia longiseta	1	+	1	2						10	4		5			1				
Keratella cochlearis			1	+													9	11	3	10
K. quadrata	+		1	+			+													
Lecane # 1				+	2	1		+	38	32		5		1	13	7	2			
Lepadella							2													
Monostyla bulla # 1										2				+		1				
Monostyla # 2												+								
Mothalca				+			1				1	1			4	1	+			
Platylas patulus	+	1	1	1		8			50	4	1	+			1	3				
P. quadricornus		1	1		+				8	1			2							
Polyarthra				+					3		8	5	22		14	390	60	4	3	3
Testudinella				+	+		2	+					2		1					
Trichocera											2									
Unknown # 1	+	2	2	+	1		1	+			2		3	3	2	4	14			

Table VII-2 (con't) ZOOPLANKTON #/Liter September, 1978 (Except #18-20, November, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Unknwon # 2													3				1			
Unknown # 3																		71	10	3
Unknown # 4									63											
Unknown # 5											2					3				
Unknown # 6																	1			
Cladocera																				
Alona rectangula								+	4					+			+			
B. longirostris	1	+	2	+					2								+			
Ceriodaphnia megalops																	+			
Chydorus sphaericus							4				1									
Daphnia ambigua									24											
D. parvula																		+		
Diaphanosoma brachyurum	1	2	66	+	+						2		4		2					
Illyocryptus sordidus																		+		
Macrothrix laticornis							+													
Moina affinis			19			28								+						
Moina micrura				+					12	1	12	1	1	1			+			
Pleuroxus denticulatus							1								+	1				
Scapholebris kingi												1				+	+			
Copepoda																				
Diaptomous pallidus						1					1								+	+
D. siciloides	+	9	70	+							2	2	1						+	
Calanoid copepodids	+	1	45	+							3	1						+	+	+
C. vernalis	+	1	2		+		+	1	28	1	+	1		+		+		+	1	1
Eucyclops agilis					+	14	5	1		1		1		+						+
E. exilis					+															
Mesocyclops edax								1	28	+										
Tropocyclops prasinus							17		272					1	1	3	2			
Unknown cyclopoid #2									1											
Cyclopoid copepodids	1	1	14	+	1	4	57	2	6	14	+	8	8	+	3	44	6		1	+
Nauplii	6	30	95	4	5	25	234	12	518	315	123	199	220	8	23	75	7	4	1	1

ZOOPLANKTON

Table VII-2 #/Liter September, 1978 (Except #18-20, November, 1978)

TAXA	SITE NUMBER																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Insecta																				
Chaoborus						1							+		5	1	+			
Total Number of Species	20	14	22	24	14	16	14	13	18	22	24	21	18	18	17	23	22	14	15	16
Total Number Individuals/Liter	32+	24+	514	16+	10+	620	325+	23+	1090	873	332+	251+	828+	30+	218+	665+	349+	122+	43+	51+

in July, thirteen to twenty-four in September. Excluding the two extremes in July, the range was thirteen to twenty-six taxa per site, similar to the September range. The number of organisms per site varied greatly, from one plus to 2062 per liter in July and from ten plus to 1090 per liter in September. There was an average of 248+ organisms per liter in July, 365+ organisms per liter in September, when all seventeen sites are considered.

The zooplankton data suggest that site 7 is considerably degraded in water quality. It had the lowest diversity index in both collections (Table VII-3), however, it had improved considerably by September. Site 8 with only thirteen to fourteen taxa represented during the two collection periods also showed considerable improvement from July, when the diversity index showed a degraded environment. Sites 1 and 2 were the richest of all seventeen sites in numbers per liter (2062 and 1200, respectively) in July, suggesting highly eutrophic conditions. In September, sites 9, 10 and 13 were the richest sites with 1090, 873, and 828+ individuals per liter, respectively. Site 8, on the other hand, was similar to site 14 in having the second lowest number of organisms per liter (five plus) in July. Site 5 had the lowest number of organisms per liter (ten plus) in September. In July, site 15, and in September, site 6 yielded no cladocerans in the thirty liter samples. All other sites had representatives of the three major invertebrate zooplankton groups in both summer and fall collections.

The following taxa from sites 1-17 were collected during only the one collection period indicated:

Table VII-3 DIVERSITY AND EQUITABILITY OF ZOOPLANKTON AND MACROBENTHOS

Mean diversity, $\bar{d}$, using the Shannon-Weaver function and equitability, e, for each collection in the study area.

Site #	Macrobenthos		Zooplankton (collection #1)		Zooplankton (collection #2)	
	$\bar{d}$	e	$\bar{d}$	e	$\bar{d}$	e
1	1.59	.57	1.58	.33	2.75	.45
2	2.58	.50	2.67	.53	2.90	.71
3	1.23	.38	3.22	.62	2.96	.50
4	1.64	.94	3.37	.75	2.15	.25
5	2.42	.87	2.55	.28	1.96	.36
6	1.39	.27	3.02	.41	2.19	.38
7	1.44	.47	0.00	.00	1.37	.21
8	2.05	.78	0.66	.14	2.36	.54
9	1.56	.67	3.25	.38	2.42	.39
10	1.80	.56	1.80	.30	2.59	.36
11	1.61	.80	2.92	.42	2.97	.46
12	1.67	.40	3.32	.51	1.44	.14
13	1.15	.21	2.72	.47	4.35	1.67
14	3.03	.75	0.92	.10	2.95	.61
15	3.15	1.00	2.44	.33	3.08	.71
16	2.24	.53	2.04	.24	2.33	.30
17	2.13	.34	2.53	.31	2.17	.27
18	1.99	.63	3.82	1.00	1.98	.36
19	1.94	1.00	2.82	.50	1.74	.27
20	1.33	.33	3.13	.68	2.31	.44
Mean ($\bar{x}$)	1.90	0.60	2.45	0.42	2.45	0.47
Minimum	1.15	0.21	0.00	0.00	1.37	0.14
Maximum	3.15	1.00	3.82	1.00	4.35	1.67

July

Hexarthra	Daphnia
Lecane #2	Pleuroxus trigonellus
Lecane #3	Simocephalus
Monostyla quadridentata	Unknown Cladocera #1
Mytilina	Cyclops varicans rubellus
Rotaria neptunia	Ectocyclops phaleratus
Syncheata	Macrocyclops albidus
Unknown rotifer #7	Mesocyclops
Bomina coregoni	Paracyclops fimbriatus poppei
	Unknown Cyclopoid #1

September

Brachionus budapestinensis	Macrothrix laticornis
B. plicatills	Eucyclops exilis
B. rubens	Mesocyclops edax
Epiphanes	Tropocyclops prasinus
Daphnia ambigua	Unknown Cyclopoid #2

The number of zooplankton taxa collected declined in general in September compared to July. The number collected remained the same at two sites, increased at four sites, and declined at eleven sites during September. The taxa that were found most frequently and in relatively large numbers are discussed below.

The rotiferan occurring at the largest number of sites during July (sixteen of seventeen) was an unidentified one (possibly Epiphanes) of small size. It occurred in large numbers, 115 and seventy per liter, only at sites 1 and 2, respectively. Occurring at fourteen sites each in July were Brachionus angularis, B. calyciflorus, B. havanaensis and Filinia longiseta. These were followed by B. bidentata and Platyias patulus at thirteen sites, B. caudatus and Lecane #1 at twelve sites, Asplanchna and Euchlanis at eleven sites, B. quadridentatus, Cephalodella and Polyarthra at ten sites, and Keratella cochlearis at nine sites, all in July.

Eleven of the fifteen most commonly found July taxa of rotifers

(listed above) were found at eight or more sites in September. Brachionus havanaensis, Cephalodella, Euchlanis and Keratella cochlearis were collected at considerably fewer sites in September while Brachionus urceolaris occured at eight sites in September compared to only three sites in July.

Organisms of the genus Brachionus are worldwide in distribution but confined to water with a pH above six and six-tenths, according to Ahlstrom (1940). B. quadridentatus, B. angularis, B. calyciflorus and B. urceolaris are very widely distributed, B. bidentata less so. B. havanaensis is one of the most common species in North America but is not found elsewhere except in South America. B. calyciflorus was found by Chu (in Ahlstrom 1940) to have a life cycle span varying from twelve to nineteen days for females. Probably other species of Brachionus have similar life spans.

Filinia longiseta as well as B. angularis, B. calyciflorus, B. quadridentatus, Keratella cochlearis and Polyarthra euryptera are indicators of eutrophic conditions. Because of their high rates of natural increase and high population turnover rates, these and other rotifers respond more quickly to environmental changes than do crustacea and appear to be more sensitive indicators to environmental changes in water quality (Gannon and Stemberger, 1978).

Diaphanosoma brachyurum occurred most frequently among the Cladocera, being found at eleven sites in July and eight in September. It was followed by Bosmina longirostris and Moina micrura, both at eight sites in July and six and eight sites, respectively in September. All taxa encountered are grazers on bacteria, protozoa,

algae and organic detritus of all kinds, according to Pennak (1953). The common species, and additionally Chydorus sphaericus, often exhibit single long population pulses during the warmer months. According to Gannon and Stemberger (1978), B. longirostris has been utilized as an indicator of eutrophic conditions. Support for this is offered in the present study where B. longirostris occurred in numbers greater than three per liter during July only at sites 1, 2, and 3 where the three heaviest total concentrations of organisms encountered were found then.

Cyclops vernalis was the most commonly occurring Copepoda, being recovered from eleven sites in July, twelve in September. Diaptomus siciloides was found at eight sites in July and seven in September, followed by Eucyclops agilis at seven sites both times. Paracyclops fimbriatus was found at six sites in July, Tropocyclops prasinus at six sites in September. Gannon (1972) believes that Diaptomus siciloides may be a useful early-warning indicator of advancing eutrophication in the Great Lakes. In the present study this species and C. verbalis occurred in greatest frequencies at sites 1, 2, and 3 which were the most eutrophic sites if total numbers of zooplanktonic organisms per liter is considered.

Sites 18 through 20 were very similar in their zooplankton to one another. For example, sixteen (sixty-seven percent) of the twenty-four zooplankton taxa taken at one or more of the sites 18-20 during September were taken at all three sites. Similarly, twelve (sixty-three percent) of the nineteen taxa taken in November were taken at

all three sites. Four taxa from sites 18-20 were unique to one or more of the three sites: Unknown Rotifer #3, Conochiloides, Daphnia parula and Illyocryptus sordidus. The rotifer #3 was present at all three sites (18-20) at both collection times and thus was the only constant indicator of the "large, canal" type environment.

As with collections from sites 1-17, the number of taxa collected during the later (November) period was lower than the number collected earlier (September). Of twenty-seven taxa taken in total during the two collection periods, sixteen taxa were present both times, eight in September only, and three in November only.

The quality of the water at the Chain of Rocks Canal sites as indicated by Diversity Index and Equitability (mean three and twenty-six hundredths and seventy-three hundredths, respectively) was higher than those for sites 1-17 (mean two and fifty-three hundredths and forty-nine hundredths, respectively) in September.

BENTHOS

Materials and Methods

One set of both quantitative and qualitative benthic collections were made at each of the twenty designated sites. Five quantitative samples taken from the major bottom habitat types at each site using an Ekman grab (except at site 5) were pooled, cleaned of small materials with stream water using a U.S. Standard No. 30 brass screen sieve, then fixed in neutralized ten percent formalin containing Rose Bengal stain. At site 5, two Ekman grabs and three

Surber samples were pooled to form the composite sample.

Approximately one-half man-hours of effort was expended in obtaining qualitative samples from all habitat types of each site using both a long-handled aquatic net and a No. 30 sieve. The samples were sieved, fixed, sorted, and identified in the same manner as the qualitative samples. Benthic organisms encountered during seining were added to the appropriate qualitative samples.

All samples were collected by Donal Myer with the assistance of Thomas Keevin. Samples from sites 1 through 17 were taken between July 11 and July 21, 1978 while those from sites 18 through 20 were taken September 13 and 14, 1978. Prior to identification samples were processed in the laboratory by Marina Ferrari. They were washed in tap water in a No. 30 sieve to remove fine particles and formalin. Organisms were hand sorted with the use of a dissecting microscope, then stored in separate vials with seventy percent ethanol until identified. The number of benthic organisms in each composite sample was multiplied by a conversion factor of 8.6111 (1550/36 X 5) to obtain the number per square meter except site 5 where a factor 3.0754 (1550/(2 X 36 +3 X 144) was used. Identifications were made by Donal Myer to the lowest taxon possible using primarily the following references: Beck (1976), Edmondson (1959), Mason (1973), Pennak (1953), Sawyer (1972), and Usinger (1956). Species diversity indices (d) were calculated using the Shannon-Weaver formula and evenness (equitability) indices by comparing the number of species in the sample with the number of species expected from a community that conforms to

MacArthur's model (Weber, 1973).

Results and Discussion

The Benthic macroinvertebrates of the study area (Table VII-4) are chiefly organisms that are facultative or tolerant of moderate to high levels of organic pollution. The classification of the tolerance of various macroinvertebrate taxa to decomposable organic wastes was obtained from Weber (1973). Tubificids comprise the dominant family. They constitute eighty-eight percent of all oranisms in the quantitative collections and range from only nine percent at site 5 to ninety-nine percent at site 13. Other families well represented in the quantitative collections are the Naididae (Oligochaeta) constituting five percent of the organisms collected (thirty percent of the organisms at site 1) and the Chironomidae constituting four percent of the organisms collected (seventy-two percent of organisms at site 8). Asellidae (Crustacea) were the most abundant organisms at sites 5 and 7, constituting forty-six percent and seventy-five percent, respectively, of the organisms collected there. Groups well represented in the qualitative collections in addition to the above are Hirudinea, Astacidae, and a number of aquatic insect orders, especially the Odonata, Ephemeroptera, Hemiptera, and Coleoptera. The Chironomidae outnumbered all other families in the number of taxa represented in both quantitative collections (seventeen taxa) and qualitative collections (twenty-four taxa, of which eleven are not represented among the seventeen taxa in the quantitative collections).

Table VII-4

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Coelenterata																					
Hydrozoa																					
Hydridae																					
Hydra	F						9										9			*	
Rotifera																					
Floscularidae																					
Limnias											*										
Nematoda																					
Aphasmidia																					
Labronema	F																				9
Unknown A	F														17						
Bryozoa																					
Plumatellidae																					
Plumatella repens	F						9					*									
Endoprocta																					
Urnatellidae																					
Urnatella gracilis	F															43					
Annezida																					
Oligochaeta																					
Naididae																					
Dero aulophorus vagus	F						*			*											
Dero digitata	F	1206	69				9			103	86	34	758	95		17		482			
Haemonais waldvogeli										34											
Ophdionais serpentina	T												34								
Pristina longiseta	F												69								
Sparganophilidae																					
Sparganophilus tamesis		34	17				34							*				17			

T = Tolerant F = Faculative I = Intolerant
* = Present in Qualitative Collection Only

Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Tubificidae																					
Aulodrilus piqueti	T												34								
Limnodrilus cervix	T	138	103	517			164		*				69	95	17	43	155	207			
Limnodrilus claparedianus	T		17												34	9	69				
Limnodrilus hoffmeisteri	T	276	138	723	34	3	517			379	181	69	207	1145	26		*	*	17		9
Limnodrilus maumeensis	T															17	267	1378	396	52	267
Limnodrilus udekemianus	T		17	34			69	*					34	43	9			138	43		
Limnodrilus immatures	T	2273	844	5959	164	15	2859	26	86	930	715	379	2273	15715	224	232	990	3169	611	121	2239
Tubifex tubifex	T	34					34			34	52			4039	17	9		276		9	164
Hirudinea																					
Erpobdellidae																					
Mooreobdella microstoma	T											*						*			
Erpobdella punctata	T										*		*								
Glossiphonidae												*									
Helobdella elongata												*									
H. stagnalis	T												*								
Placobdella montifera	T									*	*		*								
P. ornata	F						*														
Unidentified			17	*	*		34		*												
Mollusca																					
Gastropoda																					
Pulmonata																					
Lymnaeidae																					
Lymnaea	F										*			9							
Planorbidae																					
Heliosoma	F						*				9										
Physidae																					
Physa gyrina	F						*		*		*		*	43			*	*			
P. integra	T										*										

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Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Peleoypoda																					
Unionidae																					
Anodonta grandis	F												*								
A. suborbiculatus													*								
Carunculina parva							*						*								
Sphariidae																					
Musculium transversum	T,F						*												17		
Unidentified-small	T					3														26	164
Arthropoda																					
Crustacea																					
Amphipoda																					
Gammaridae																					
Gammarus pseudolimnaeus	F					*															
Talitridae																					
Hyalella azteca	F							9	*				*		*	*	*	*			
Cladocera																			*	*	*
Sididae																					
Sida crystallina																					
Copepoda																					
Argulidae																					
Argulus			*																		
Decapoda																					
Astacidae																					
Cambarus diogenes	T									*											
Orconectes immunis														*							
O. virilis			*			3		*	*		17	*			*						
Procambarus acutus	T										*										
Unidentified-small		*		*			*									*	*	34			
Palaemonidae																					
Palaemonetes kadiakensis	F	*										*	*		9						

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Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Isopoda																					
Asellidae																					
Asellus brevicauda					9	3		232	9												
A. intermedius	F				26	25	*		*				*		9	9		*			
Insecta																					
Odonata																					
Aeschnidae																					
Anax sp.	I												*	*							
Epiaeschna heros	I					*															
Libellulidae																					
Libellula sp.	F										*			9	*						
Perithemis domitia												34									
Sympetrum sp.														*							
Agrionidae																					
Hetaerina sp.	I								*												
Coenagrionidae																					
Argia sp.	F			9																	
Enallagma sp.	F				*													9			
Ischnura sp.	T,F,I				*	*			*		9		*	9	9	*	*	*			
Neoneura sp.																*					
Ephemeroptera																					
Baetidae																					
Callibaetis ferrugineus	F										*		*			*	*	*			
Centropetilum sp.	I								*								*				
Siphlonurus sp.															9						
Unidentified-partial		*			*	*		9													
Caenidae																					
Caenis sp.	F					*			*		*	*	*			*		*			
Ephemeridae																					
Hexagenia limbata	I																	*	60		

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* = Present in Qualitative Collection Only

Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Heptageniidae																					
Stenonema interpunctatum								*	*		*							*	*	*	
Hemiptera																					
Belostomatidae																					
Belostoma sp.	T													*							
Corixidae																					
Trichocorixa sp.		*		34	*								34		26	*	*	17			
Gerridae																					
Gerris marginatus	T						*		*		*			*							
G. remigis	T				*	*		*	*												
Trepobates inermis	F		*																		
Notonectidae																					
Notonecta sp.		*											*	*							
Trichoptera																					
Hydropsychidae																					
Cheumatopsyche sp.	F							*	*						*						
Psychomyiidae																					
Polycentropus sp.	F,I																	*	*		
Coleoptera																					
Dytiscidae																					
Laccophilus fasciatus	T			*		*								*				9			
Elmidae																					
Dubirhaphia sp.	F															*	*	*			
Gyrinidae																					
Dineutus hornei	F		*															*			
Haliplidae																					
Peltodytes sp.	F																*				

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* = Present in Qualitative Collection Only

Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Hydraenidae																					
Unidentified larva																		*			
Hydrophilidae																					
Berosus infuscatus	T												*								
Tropisternus glaber				*																	
T. mexicanus striolatus											*										
Tropisternus larvae			*							*			*								
Diptera																					
Anthomyiidae																					
Limnophora aequifrons	F		*	*																	
Ceratopogonidae																					
Palpomyia complex # A	T,F		17										*				9	9			
Palpomyia complex # B	T,F																	*			
Culicidae																					
Anopheles sp.	T								*												
Culicid pupa						*															
Chaoborus sp.	F,I		52							34		69									
Sciomyzidae																					
Unidentified larva											*										
Simuliidae																					
Unidentified larva	I							*													
Stratiomyiidae																					
Stratiomyia sp.	T		*																		
Tabanidae																					
Tabanus sp.	F		*				*											*			
Tipulidae																					
Unidentified pupa								*													

T = Tolerant F = Faculative I = Intolerant
* = Present in Qualitative Collection Only

Table VII-4 (con't)

BENTHIC INVERTEBRATES
#/Sq. Meter

TAXA	POLLUTION TOLERANCE INDEX	SITE NUMBER																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Chironomidae																					
Chironominae																					
Chironomus attenuatus	T		17	422	26		103		34	*		*			52	9	26	77			
Cryptochironomus blarina	F																	*			
C. fulvus	F		34			6		17	26			*			26	*	34	9			
Cryptotendipes sp.	F												*								
Dicrotendipes modestus	F																			*	
Glyptotendipes lobiferus	T	*	*	60		*	*				*	*				*	17	*	*		
Kiefferulus dux	T,I									*											9
Leptochironomus sp.																	26				
Paracladopelma sp.																*					
Paralauterborniella sp.									*												
Polypedilum illinoense	F,I				*	*	*	*	*						*	*	52	*	*	*	*
P. ontario									164		52				*						
Rheotanytarsus sp.	F								9												
Tanytarsus sp.	I																*				
Tribelos fuscicornis	I															*		*			
Xenochironomus xenolabis	F,I																			*	
Unidentified pupae		34	52	*	*	3			*			*		9	*	9	*	*			
Orthocladinae																					
Cricotopus sp.	F,I														*						
Parametriocnemus sp.								9													
Psectrocladius	F,I				*																
Tanypodinae																					
Ablabesmyia americana	F																			*	
A. cinctipes	F																		9		
A. mallochi	F,I						*								*	9	*	*			
Coelotanypus concinnus	F		17	*								*		*			*	26	172	95	86
Conchapelopia complex	F								9						*	*					
Pentaneura sp.	T,F,I				*			9								*		*			
Procladius sp.	T,F		17				*						34	26	43	121	155	103			9
Tanypus neopunctipennis			155										*	26				*			
Total Taxa ($\bar{x}$ = 21.1)		13	25	15	15	20	25	15	25	12	23	17	30	22	25	27	26	40	13	12	11
Total Taxa in Quanitative ($\bar{x}$ = 9.4)		7	16	8	5	8	11	7	7	6	8	5	10	13	15	12	12	16	8	5	9
Total Individuals/Square Meter		3995	1583	7758	259	61	3841	311	337	1514	1121	585	3546	21263	527	570	1809	5960	1325	303	2956

T = Tolerant
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I = Intolerant
* = Present in Qualitative Collection Only

Mean diversity suggests that two sites (14 and 15) are unpolluted, the remainder semi-polluted. Equitability values below five tenths, suggesting degradation of the waters, were found at sites 3, 6, 7, 12, 13, 17, and 20. Comparison of the diversity indices of the benthos with those of the zooplankton collected at the same time reveals differences greater than one in twelve instances (i.e., at twelve sites). The zooplankton showed the greater diversity index in nine instances; the benthos in only three instances. If zooplankton are better indicators because of their faster generation time (and therefore faster recovery), then conditions are better at nine sites and worse at three sites than the benthos indicate.

From one to three taxa classified as strictly intolerant of organic pollution were found at eleven of the twenty collection sites. Only one of these intolerant taxa, Hexagenia limbata, was found in a quantitative collection (site 18). Taxa intolerant of organic pollution found in qualitative collections during the study are: Anax sp. at sites 12 and 13 and Epiaeschna heros at site 5 (both Aeschnidae), Hetaerina (Agrionidae) at site 8, Centropetilum (Baetidae) at sites 8 and 16, Hexagenia limbata (Ephemeridae) at sites 7, 8, 10, 17, 18, and 19, a simulid at site 7, Tanytarsus sp. (Chironominae) at site 16, and Tribelos fuscicornis (Chironominae at sites 15 and 17. Designation of some of these taxa as intolerant should be accepted with reservation, e.g., a species of Anax, Hexagenia sp., and two species of Tanytarsus are listed as moderately tolerant of pollution by the Illinois EPA.

The average number of taxa present per site was twenty-one and one tenth (nine and four tenths for quantitative collections only). This is very similar to the numbers found in similar situations in the area in other studies. The specific number of taxa showed considerable variation between sites. Only eleven taxa were taken at site 10 while forty taxa were taken at site 17.

Distributional interactions between taxa are shown in Table VII-5. The diagonal from upper left to lower right gives the number of taxa unique to each site. The largest number of unique taxa were found at site 12 (nine taxa) while none was found at sites 1 and 6. To the right of the diagonal are numbers of taxa found at two sites only. No two sites shared more than a single taxon between them alone except sites 17 and 18 which shared two taxa. To the left of the diagonal are the total number of taxa shared between any two given sites (but not between them alone) in addition to those listed to the right. For example, sites 17 and 18 shared ten taxa, two of which were shared only between these sites and eight which also occurred at other sites. Other interesting distributions not illustrated in the table include the following: Dubirhaphia sp. was recovered at three contiguous sites, sites 15-17, Sida crystallina at the three contiguous sites 18-20 (the Chain of Rocks Canal), while Limnodrilus maumeensis was recovered at sites 15 through 20, six sites with the deepest channels. The numbers recovered in quantitative collections of sites 15-17 increased rapidly as the channel increased in size approaching the Mississippi River. The taxa that were found at nine or more of

Table VII-5

Interaction Between Taxa and Sites

(Benthos Only)

Site Sites	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																				
2	7	3	1			1											1			
3	7	10	2																	
4	6	5	7	1													1			
5	4	6	5	8	3															
6	8	10	7	7	5				1	1	1	1						1		
7	2	4	2	6	6	3	3													
8	3	7	4	9	10	7	9	4								1				
9	4	6	3	3	2	5	1	2	3											
10	5	5	3	3	6	7	3	8	5	5		1	1							
11	6	10	6	4	7	4	3	6	5	6	3						1			
12	8	9	4	5	5	8	3	6	6	9	5	9	1							
13	8	10	6	4	5	8	2	5	4	8	5	11	3							
14	6	10	6	9	9	9	8	13	4	7	6	9	9	3						
15	8	9	6	9	8	9	5	10	4	7	7	10	7	14	3		1			
16	7	10	8	8	7	11	4	8	3	6	7	9	7	11	18	3				
17	10	15	10	10	10	12	7	11	5	10	9	16	13	15	23	18	3	2		
18	3	5	5	3	4	5	4	3	2	4	4	3	4	4	5	6	8	1		
19	2	2	2	2	3	4	3	3	2	3	2	2	3	3	4	5	6	6	3	
20	3	4	3	3	4	5	2	2	3	3	3	4	5	5	6	6	7	6	7	1
Total Taxa by Sites	13	25	15	15	20	25	15	25	12	23	17	30	22	25	27	26	40	13	12	11

taxa in common at three or more sites

120 Total

the twenty sites are discussed below.

The naidid worm, Dero digitata, was found at sites, 1, 2, 6, 9-13, 15, and 17. It is cosmopolitan in distribution and has been reported at scattered localities over the United States including Illinois (Harmen, 1973). It lives in mucous tubes according to Brinkhurst and Jamieson (1971). This gilled form reproduces asexually only as do most naidids. It is probably a detritus feeder.

Limnodrilus hoffmeisteri was found at sixteen sites, all except sites 7, 8, 15, and 19. Limnodrilus cervix was recovered at sites 1-3, 6, 8, and 12-17, L. udekemianus at sites 3, 4, 6, 7, 12-14, and 17-18. Tubifex tubifex was found at sites 1, 6, 9, 10, 13-15, 17, 19, and 20. All of these species are cosmopolitan in distribution except L. cervix which is Pan-American. All of the tubificids recovered are organic substrate feeders and typically are most abundant in muds of organically polluted environments. According to Hart and Fuller (1974), L. hoffmeisteri and T. tubifex, the most commonly encountered species in this study, are particularly tolerant of gross organic pollution. The occurrence of four or five species of tubificids at sites 2, 4, and 12 through 17 suggests better quality at these sites than elsewhere. This is supported by diversity data from only five of the sites, sites 2 and 14-17.

The odonata Ischnura was taken at half the sites, sites 4, 5, 8, 10, and 12 through 17. No other odonata was collected at more than three sites in the study area. It is the only genus of odonata found at BODs greater than ten ppm and tolerant to chemical extremes of DO, Mg, NO_3, SO_4, and turbidity, more categories than any other genus

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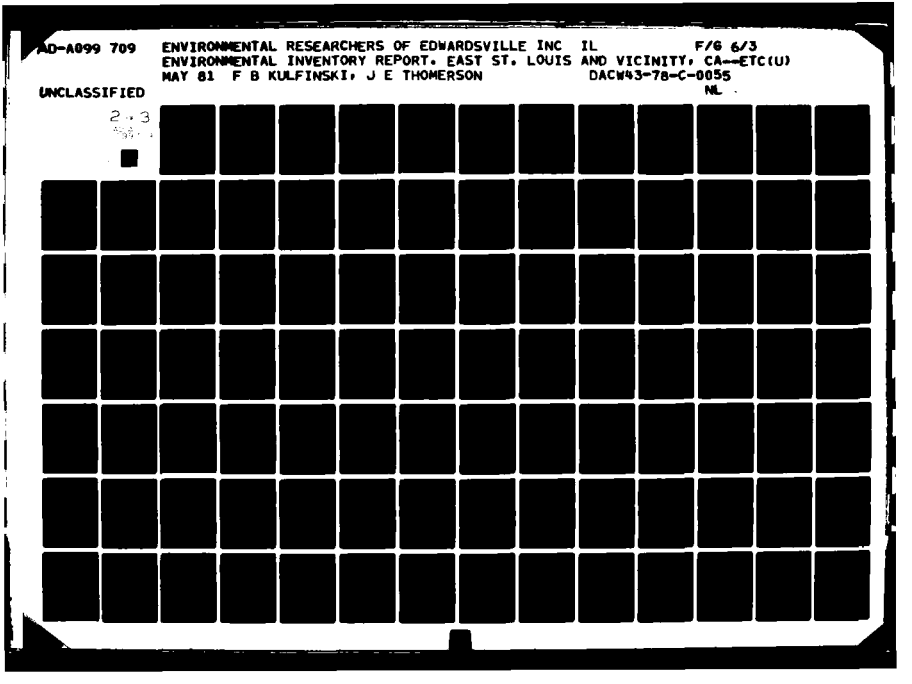

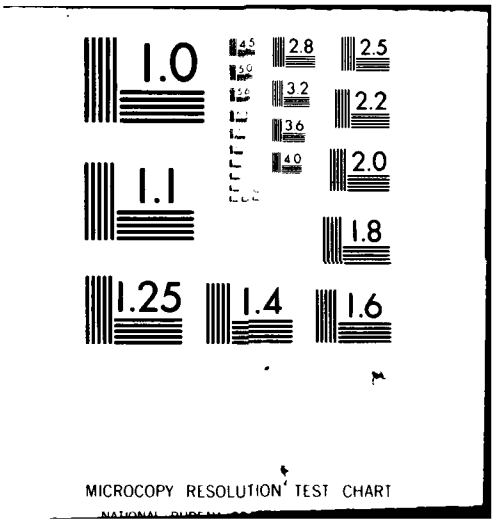
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5.0
5.6
MICROCOPY RESOLUTION TEST CHART

(Hart, et al., 1974). This damsel fly larva was taken more often in qualitative than quantitative samples and was usually associated with algae. It, as most odonata, is predaceous in food habits.

All genera of midge larvae collected are cosmopolitan in distribution. The environmental requirements and pollution tolerance of the chironomids found at nine or more sites in this study are given in Table VII-6 (derived from Beck, 1977). The chironomids have representatives tolerant of many chemical extremes. Polypedilum illinoense, taken at twelve collection sites, is tolerant to pH between three and eight and eight tenths, alkalinity to 220 ppm, chloride to 2750 ppm, iron to sixteen ppm, and sulfate to 570 ppm. Chironomus attenuatus and Glyptotendipes lobiferous are similar to P. illinoense in their tolerance to chemical extremes except that they are more tolerant to low DO, C. attenuatus less tolerant to high chloride concentrations, and G. lobiferous less tolerant to high concentrations of iron. The ability of these three most commonly recovered chironomids to survive wide ranges of chemical extremes no doubt accounts for their high frequency and wide distribution in this study area.

Only two species collected in the Cahokia Drainage Area represent significant range extensions. Haemonais waldvogeli has only recently been reported in Louisiana, Missouri, Mississippi, and Texas in addition to a Michigan collection reported in 1922 (Harmen, 1975). Aulodrilus piqueti has been reported in Lake Michigan in Illinois, but not elsewhere in the state (Stimpson, et al., 1975). Both of these species were collected in Green County, Illinois, in 1977 and reported in the Eldred-Spankey Aquatic inventory.

Table VII-6

Environmental Requirements and Pollution Tolerance
of Common Chironomids of the Study Area

Species	pH	Nutrient	Degradable Dissolved Organics	Temperature	Feeding Behavior	Sites Found
Chironomus attenuatus	Indifferent	Meso-Eutrophic	Saproxenous to Saprophilic	15-30°C	Scavenger Predator	2-4,6,8,9, 11,14-17
Cryptochironomus fulvus	Indifferent	Mesotrophic	Saprophobic to Facultative	15-30°C	Predator Omnivore	2,5,7,8,11, 14-17
Glyptotendipes lobiferous	Indifferent	Meso-Eutrophic	Saprophobic to Facultative	15-30°C	Scavenger	1-3,4,5,10, 11,15-18
Polypedilum illinoense	Indifferent	Mesotrophic	Saprophobic to Facultative	15-30°C	Omnivore	4-8,14-20
Coelotanypus concinnus	Indifferent and Alkaliphilous	Meso-Eutrophic	Saproxenous to Facultative	15-30°C	Scavenger Predator	2,3,11,13, 16-20
Procladius bellus	Indifferent and Alkaliphilous	Oligo-Eutrophic	Saprophobic to Saproxenous	15-30°C	?	2,6,12-17,20

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SECTION VIII
BIOLOGICAL ELEMENTS - FISH

PREPARED BY

JAMIE E. THOMERSON, PH. D.

FISH

Fish collections were made at the twenty aquatic sampling sites which are described in Table V-2 in Volume 3 of 6 of this Environmental Inventory Report. Fishes were collected using a Smith-Root Type V backpack electrofisher with a generator attached to maintain battery charge level, four feet by ten feet, one fourth inch Delta mesh seine, and six feet by fifteen feet, one fourth inch Delta mesh seine. Monofilament gill nets with one-half and three-fourths bar were used as block nets. Gill nets with one-half, one, two, and two and one-half inch bar were used at the Chain of Rocks Canal and the Cahokia Diversion Channel. Electrofishing in the Chain of Rocks was attempted but was unproductive. Fish collections were made by Thomerson, Keevin, Miller, White, Becker and Shetley.

Thirty-two fish species taken during the study (Table VIII-1) are classified by faunal group following Pflieger (1971). Thomerson (1974) showed this faunal group concept to be useful in understanding fish distribution in the St. Louis Metropolitan Area.

Twenty-two species were collected in the Cahokia Drainage Area and it is unlikely that any common or widespread species were missed. However, Thomerson (1973) earlier listed species which may enter the nearby Harding Ditch Combined Drainage Area. This list would also be valid for the Cahokia Drainage Area.

The fourteen species taken from the Cahokia Diversion Channel undoubtedly included the most common species in the Diversion Channel, although several additional species have been reported from the upper parts of the drainage (FHWA-IDOT, 1977), and other

Table VIII-1 FISHES COLLECTED IN THE STUDY AREA

Common Name	Scientific Name	Faunal Group	Number Collected/Pounds Collected/Pounds Per Acre				
			Site Date: Day/Month				
			1 4/10	2 30/9	3 22/9	4 17/7	5 3/7
spotted gar	Lepisosteus oculatus	L					
shortnose gar	Lepisosteus platostomus	BR					
bowfin	Amia clava	L					
skipjack herring	Alosa chrysochloris	BR					
gizzard shad	Dorosoma cepedianum	WR	8/.3/3.0	148/8.2/80.2	54/2.2/59.5	236/1.9/46.1	
goldeye	Hiodon alosoides	BR					
mooneye	Hiodon tergisus	WR					
carp	Cyprinus carpio	WR	1/<.1/.4	40/11/108.8	29/1.2/32.2	2/<.1/.2	3/<.1/.7
golden shiner	Notemigonus crysoleucas	WR					
fathead minnow	Pimephales promelas	P	3/<.1/.1	7/<.1/.2	249/.6/15.2	560/1/27	44/.1/1.5
creek chub	Semotilus atromaculatus	OP		2/.2/1.5		1/<.1/<.1	16/.5/6.4
emerald shiner	Notropis atherinoides	BR				1/<.1/<.1	1/<1/<.1
bigmouth shiner	Notropis dorsalis	P					
red shiner	Notropis lutrensis	P					
river carpsucker	Carpiodes carpio	P					
carpsucker juveniles	Carpiodes sp.						2/<.1/.3
white sucker	Catostomus commersoni	OP					4/.2/2.7
shorthead redhorse	Moxostoma macrolepidotum	OP					
yellow bullhead	Ictalurus natalis	WR		3/<.1/.5			
black bullhead	Ictalurus melas	WR	2/<.1/<.1	3/<.1/1.1		1/<.1/<.1	3/<.1/.1
channel catfish	Ictalurus punctatus	WR	2/<.1/.3				
flathead catfish	Pylodictis olivaris	WR					
mosquitofish	Gambusia affinis	L	19/<.1/.2	42/<.1/.3	24/<.1/.6		
white bass	Morone chrysops	BR					
green sunfish	Lepomis cyanellus	WR	3/<.1/.2	8/.2/2		5/.1/2.5	
orangespotted sunfish	Lepomis humilis	P	1/<.1/<.1	5/<.1/.7	11/.1/2	1/<.1/<.1	
bluegill	Lepomis macrochirus	WR	7/<.1/.5			4/<.1/.6	
largemouth bass	Mictopterus salmoides	WR				2/<.1/<.1	
white crappie	Pomoxis annularis	WR					
black crappie	Pomoxis nigromaculatus	WR					
walleye	Stizostedion vitreum	WR					
freshwater drum	Aplodinotus grunniens	BR	1/<.1/.4	1/<.1/.4			
Total Number Collected			47	259	367	813	73
Total Pounds/Pounds Per Acre			0.5/5.3	20.1/196	4.1/110	3.1/77	0.8/12
Number of Species Collected			10	9	5	10	7
Mean diversity, $\bar{d}$ - eveness, e			2.62 - 0.85	1.94 - 0.50	1.48 - 0.70	1.06 - 0.25	1.76 - 0.62

WR = Wide Ranging BR = Big River P = Prairie L = Lowland OP = Ozark Prairie Weights to nearest 0.1 lb.

Table VIII-1 cont. FISHES COLLECTED IN THE STUDY AREA

Common Name	Scientific Name	Faunal Group	Number Collected/Pounds Collected/Pounds Per Acre				
			Site Date: Day/Month				
			6 17/7	7 17/7	8 17/7	9 20/8	10 3/7
spotted gar	Lepisosteus oculatus	L	1/<.1/1.4				
shortnose gar	Lepisosteus platostomus	BR				5/1.0/9.2	
bowfin	Amia clava	L					36/1.8/45.4
skipjack herring	Alosa chrysochloris	BR					
gizzard shad	Dorosoma cepedianum	WR	1/<.1/.2				
goldeye	Hiodon alosoides	BR					
mooneye	Hiodon tergisus	WR					
carp	Cyprinus carpio	WR	11/0.1/4.2	1/<.1/.3	1/<.1/.4	2/.2/1.5	20/.2/5.2
golden shiner	Notemigonus crysoleucas	WR					1/<.1/<.1
fathead minnow	Pimephales promelas	P	39/<.1/2.3	20/<.1/1.4 35/.3/11.1	35/.2/3.9 62/.3/8		25/<.1/.8
creek chub	Semotilus atromaculatus	OP					
emerald shiner	Notropis atherinoides	BR					
bigmouth shiner	Notropis dorsalis	P			2/<.1/.1		
red shiner	Notropis lutrensis	P					
river carpsucker	Carpiodes carpio	P					
carpsucker juveniles	Carpiodes sp.		2/<.1/.2				
white sucker	Catostomus commersoni	OP					
shorthead redhorse	Moxostoma macrolepidotum	OP					
yellow bullhead	Ictalurus natalis	WR	1/<.1/<.1				
black bullhead	Ictalurus melas	WR				15/.8/7.2	5/.5/12.7
channel catfish	Ictalurus punctatus	WR	2/<.1/.2				
flathead catfish	Pylodictis olivaris	WR					
mosquitofish	Gambusia affinis	L					2/<.1/<.1
white bass	Morone chrysops	BR					
green sunfish	Lepomis cyanellus	WR	8/<.1/.4	1/<.1/<.1	3/<.1/.1	1/<.1/.4	64/.6/15.7
orangespotted sunfish	Lepomis humilis	P					2/<.1/1.0
bluegill	Lepomis macrochirus	WR	13/<.1/.3		1/<.1/.5	3/<.1/.4	
largemouth bass	Micropterus salmoides	WR	3/<.1/.6	1/<.1/<.1	2/<.1/.4		2/<.1/.2
white crappie	Pomoxis annularis	WR				1/.1/1.0	
black crappie	Pomoxis nigromaculatus	WR				1/<.1/.6	
walleye	Stizostedion vitreum	WR					
freshwater drum	Aplodinotus grunniens	BR					
Total Number Collected			81	58	106	28	157
Total Pounds/Pounds Per Acre			0.3/10	0.4/13	0.5/13	2.3/20	3.2/81
Number of Species Collected			10	5	7	7	9
Mean Diversity, $\bar{d}$ - Eveness, e			2.33 - 0.68	1.24 - 0.58	1.47 - 0.50	2.06 - 0.79	2.26 - 0.72

WR = Wide Ranging BR = Big River P = Prairie L = Lowland OP = Ozark Prairie Weights to nearest 0.1 lb.

Table VIII-1 cont. FISHES COLLECTED IN THE STUDY AREA

Common Name	Scientific Name	Faunal Group	Number Collected/Pounds Collected/Pounds Per Acre				
			Site Date: Day/Month				
			11 22/10	12 22/10	13 17/7	14 3/7	15 10/9
spotted gar	Lepisosteus oculatus	L					
shortnose gar	Lepisosteus platostomus	BR					
bowfin	Amia clava	L					
skipjack herring	Alosa chrysochloris	BR					
gizzard shad	Dorosoma cepedianum	WR	6/.6/11				14/1.1/7.2
goldeye	Hiodon alosoides	BR					
mooneye	Hiodon tergisus	WR					
carp	Cyprinus carpio	WR		3/2/44.3	4/<.1/.5	9/<.1/2.1	1/.2/1.1
golden shiner	Notemigonus crysoleucas	WR		2/<.1/.1	1/<.1/<.1	1/<.1/.2	1/<.1/.1
fathead minnow	Pimephales promelas	P		81/.1/2.7	140/<.1/1.8	3/<.1/.4	
creek chub	Semotilus atromaculatus	OP					
emerald shiner	Notropis atherinoides	BR					5/<.1/.4
bigmouth shiner	Notropis dorsalis	P					
red shiner	Notropis lutrensis	P					
river carpsucker	Carpiodes carpio	P					
carpsucker juveniles	Carpiodes sp.					6/<.1/1.4	
white sucker	Catostomus commersoni	OP					6/3.2/21.5
shorthead redhorse	Moxostoma macrolepidotum	OP					
yellow bullhead	Ictalurus natalis	WR					
black bullhead	Ictalurus melas	WR	9/.3/4.5	21/.6/12.7		4/.4/9.1	
channel catfish	Ictalurus punctatus	WR					
flathead catfish	Pylodictis olivaris	WR					
mosquitofish	Gambusia affinis	L		38/<.1/.9			
white bass	Morone chrysops	BR					
green sunfish	Lepomis cyanellus	WR	12/.5/8.2	4/<.1/.4			
orangespotted sunfish	Lepomis humilis	P	18/.2/3.1	6/<.1/.3			2/<.1/.3
bluegill	Lepomis macrochirus	WR					
largemouth bass	Micropterus salmoides	WR	1/1.3/22.8				
white crappie	Pomoxis annularis	WR		1/.2/3.4			
black crappie	Pomoxis nigromaculatus	WR	3/.1/2				
walleye	Stizostedion vitreum	WR					
freshwater drum	Aplodinotus grunniens	BR					
Total Number Collected			49	156	145	23	29
Total Pounds/Pounds Per Acre			3/52	3/65	0.1/2	0.6/13	4.5/31
Number of Species Collected			6	8	3	5	6
Mean Diversity, $\bar{d}$ - Eveness, e			2.21 - 1.03	1.93 - 0.63	0.24 - 0.43	2.05 - 1.10	2.02 - 0.89

WR = Wide Ranging BR = Big River P = Prairie L = Lowland OP = Ozark Prairie Weights to nearest 0.1 lb.

Table VIII-1 cont. FISHES COLLECTED IN THE STUDY AREA

Common Name	Scientific Name	Faunal Group	Number Collected/Pounds Collected/Pounds Per Acre				
			Site Date: Day/Month				
			16 10/9	17 29/9	18 23/9	19 24/9	20 24/9
spotted gar	Lepisosteus oculatus	L					
shortnose gar	Lepisosteus platostomus	BR					1/1/<.1
bowfin	Amia clava	L					
skipjack herring	Alosa chrysochloris	BR				2/.9/<.1	4/3/.3
gizzard shad	Dorosoma cepedianum	WR	26/14.2/123.5	64/4.1/72.1	33/1.5/.1	22/1/<.1	7/.4/<.1
goldeye	Hiodon alosoides	BR			2/1/<.1	1/1.1/<.1	3/.2/<.1
mooneye	Hiodon tergisus	WR				1/.2/<.1	1/.2/<.1
carp	Cyprinus carpio	WR	5/3/26.2	2/5.4/94.8		2/1.6/.1	4/4.5/.4
golden shiner	Notemigonus crysoleucas	WR		3/.2/3.6			
fathead minnow	Pimephales promelas	P					
creek chub	Semotilus atromaculatus	OP					
emerald shiner	Notropis atherinoides	BR		2/<.1/.4			
bigmouth shiner	Notropis dorsalis	P					
red shiner	Notropis lutrensis	P	3/<.1/.2	4/<.1/.5			
river carpsucker	Carpiodes carpio	P	1/1.1/9.3	2/2.4/41.3			
carpsucker juveniles	Carpiodes sp.						
white sucker	Catostomus commersoni	OP	2/<.1/8.1				
shorthead redhorse	Moxostoma macrolepidotum	OP		2/1.1/18.6			1/.3/<.1
yellow bullhead	Ictalurus natalis	WR					
black bullhead	Ictalurus melas	WR					
channel catfish	Ictalurus punctatus	WR		2/.4/6.5		2/.7/<.1	1/.3/<.1
flathead catfish	Pylodictis olivaris	WR				1/.6/<.1	
mosquitofish	Gambusia affinis	L					
white bass	Morone chrysops	BR			1/.6/<.1		1/<.1/<.1
green sunfish	Lepomis cyanellus	WR					
orangespotted sunfish	Lepomis humilis	P	5/<.1/.8	1/<.1/<.1			
bluegill	Lepomis macrochirus	WR	1/<.1/.5			1/<.1/ .1	1/<.1/<.1
largemouth bass	Micropterus salmoides	WR		3/.3/4.4			1/1/<.1
white crappie	Pomoxis annularis	WR		3/.6/10.7	2/.8/<.1		
black crappie	Pomoxis nigromaculatus	WR		2/.4/6.3			
walleye	Stizostedion vitreum	WR				1/.1/<.1	
freshwater drum	Aplodinotus grunniens	BR			3/.7/<.1		
Total Number Collected			43	92	41	34	25
Total Pounds/Pounds Per Acre			19.4/169	14.9/259	4.6/.385	6.1/.509	10.9/.911
Number of Species Collected			7	12	5	9	11
Mean Diversity, $\bar{d}$ - Eveness, e			1.89 - 0.69	1,84 - 0.39	1.08 - 0.51	1.97 - 0.56	3.03 - 1.04

WR = Wide Ranging BR = Big River P = Prairie L = Lowland OP = Ozark Prairie Weights to nearest 0.1 lb.

river species (Smith, Lopinot and Pflieger, 1971; Thomerson, 1974) may enter the Channel during high water.

The fifteen species from the Chain of Rocks Canal include five big river faunal group species (Pflieger, 1971) and the canal fauna is derived from the Upper Mississippi River fauna. Lockhart (1970) provided general information on Madison County, Illinois fishes. Smith, Twillman and Thomerson (1967) surveyed Piasa Creek to the north and Putz and Thomerson (1972) studied Prairie du Pont Creek to the south of the study area.

The big river faunal group is made up of species usually restricted to large rivers. Big river species in general seem to require low gradient and continuous strong flow characteristic of large rivers.

Wide ranging species tend not to be restricted to particular physiographic provinces or faunal areas. They tend to have broad environmental tolerances and are adapted to the lake, backwater, and pond habitats, which are widely distributed in aquatic ecosytems. Needless to say, they have benefited directly from human activity in creating such lentic habitats. Also, they may benefit indirectly from human activities which degrade the habitat to the extent that other more specialized competing species may be eliminated. Wide ranging species predominate in fish faunas of habitats like those in the study area which have been heavily modified and are subject to considerable environmental fluctuation (in temperature, flow, turbidity, dissolved oxygen, and the like).

Prairie fishes have a broad ecological tolerance comparable to that of wide ranging fishes, however, they are usually absent from streams

with high gradients and continuous flows of extremely clear or cool water. They also seem less tolerant of competition than most wide ranging species. In general, they are extremely hardy fishes able to survive low oxygen, high temperatures, and periods of high turbidity.

Lowland species are characteristic inhabitants of standing water and sluggish streams having bottoms composed mostly of sand, fine gravel, and organic debris. They are now less common in the study area than in the past because they are intolerant of siltation and continuous high turbidity and are usually associated with dense aquatic vegetation.

The most common species in the study area are discussed below. A summary of life history, distribution, economic importance, etc., for the species of the area can be found in Pflieger (1975) and Smith (1978).

COMMON FISH SPECIES*

Bowfin is a lowland species somewhat intolerant of silty or swift current water. The thirty-six specimens collected at site 10 were young of the year. Bowfin are more widely distributed than the collections for this report indicate as they are found in a variety of lowland habitats, including swamps, sloughs, borrow pits, ditches, abandoned stream channels and the pools of sluggish streams. Bowfin are well known to fishermen in the area. They eat mostly fish, with gizzard shad as a preferred food item. They also eat crayfish at least in the spring and early summer. Bowfin are often caught by fishermen seeking other species and are not highly regarded as a food fish.

*Common species are discussed in the order they are listed in table VIII-1

Gizzard shad is a wide ranging species and often considered a trash fish. However, small gizzard shad are important as forage for game species, such as largemouth bass. Most of the specimens taken from the lower Cahokia Canal were small enough to fall into this category. Gizzard shad are characteristic of quiet water habitats such as lowland lakes and ponds, ditches and man-made impoundments. They are filter feeders and occur in water both clear and extremely turbid, but are most abundant in waters with high fertility and productivity.

Carp is a wide ranging species. They are an old world-exotic well established and abundant in the Mississippi basin since the 1890's. In terms of total poundage they are probably the most important fish in the area. Although not highly regarded as a sport fish they are an important commercial species and there is considerable fishing for them in the lower part of the Cahokia Drainage Canal and Cahokia Diversion Channel. They often enter ditches or sloughs to feed and (in the spring) to spawn. Fishermen in the area catch them on hook and line or with large dip nets from bridges over the Cahokia Drainage Canal. On different weekends in April, 1979, thirty to one hundred cars were counted parked along Interstate 70, Illinois Route 111 and the Canal levee between Sand Prairie Lane and Illinois Route 111. Fishermen were boating in the borrow pits between Interstate 70 and the Canal, bank fishing there and in the Canal, as well as the Horseshoe Lake outfall and dipnetting with good success in the Horseshoe Lake outfall at the Illinois Route 111 bridge. There is steady low level fishing pressure in this area throughout the summer for both carp and channel catfish.

Carp are mostly bottom feeders for insects but will take a variety of food items. They will also feed on zooplankton if it is abundant. They often enter very shallow waters in the early morning hours to feed. Carp reach a weight of about a pound in two to three years and individuals of fifteen to twenty pounds are common. Their feeding activities may increase turbidity, destroy sunfish nests and remove rooted aquatic vegetation. Although carp are not highly regarded they provide an important part of the fishing available to Illinois fishermen and are the backbone of the fee fishing lake industry.

Fathead minnows, a prairie species, were abundant in the middle reaches of Cahokia Canal and the various tributary sites. Fatheads are seldom an important forage fish but are one of the major species raised as a bait fish. They are a characteristic and common minnow of the Prairie Region of Missouri. They are intolerant of competition and are seldom found in large numbers in habitats with many other species of fish. They are, however, well suited for survival under conditions of high temperature, low oxygen, or extreme turbidity.

The creek chub is regarded by Pflieger (1971) as an Ozark-Prairie species which indicates that it is more tolerant of clear and cool water than a strictly prairie species. Creek chubs are a pioneer fish and do well in small headwater streams where few other species of fish are present. Creek chubs are able to survive in pools when streams dry up but require flowing water for spawning and build nests of gravel. Creek chubs are a dominant element in small creeks of the area like

Judy's Branch, Burdick Branch, and Schoolhouse Branch. They are present but less dominant in larger creeks like Cahokia Creek. If gravel bottoms were present in the lowland ditches they would probably be common there. Creek chubs are a generalized carnivore and may grow as large as eight inches.

Black bullheads are a wide ranging fish but tend to be most abundant in habitats with turbid water, silt bottom, no noticeable current and a lack of fish diversity. They are well adapted to the fluctuating habitat seen in drainage systems. Black bullheads were collected in numbers only at sites 9 and 12 and the comments on the fathead minnow apply to them as well. Schools of young were seen at site 11, however. Black bullheads can provide many hours of fishing pleasure in waters where few other desirable species are able to exist in any numbers. Hicks (1978) reported a population of albino black bullheads from an intermittent slough of the Cahokia Diversion Channel. A total of forty-five albinos were collected along with more than 2,000 normal black bullheads. This is the only report of albinism in this species.

Channel catfish is a wide ranging species often cultivated as food fish. They are a desirable sport fish for many anglers though they lack the promotional glamour associated with largemouth bass. They were present, as scattered juveniles, in all three areas studied. Much of the sport fishery in Horseshoe Lake is based on channel catfish although they are said to be in poor condition there. Preferred habitat is large streams having low or moderate gradients so they would not be expected in large numbers in the Cahokia Drainage Canal except perhaps

In the lower portion. Small channel catfish eat mostly insects but larger individuals have an extremely varied diet. They are most active at night and are often caught on set lines. The young survive better in turbid than in clear water, probably because they are more vulnerable to predation in clear water.

Mosquitofish is a lowland species. These small livebearers are related to the well-known guppy and are often called guppies by local residents. They inhabit shallow weedy areas where they feed mostly at the water's surface. Although they have been stocked almost world wide as a mosquito control fish, effectiveness in this regard is open to question. The females are much larger than males and only a few females are likely to survive the winter months. They produce several broods of young during the summer which reach maturity rapidly so that dense local populations may be built up where there is suitable habitat.

Green sunfish were most abundant at site 10. Green sunfish are the most widely distributed fish in Illinois and Missouri. They are often the most abundant sunfish in situations where conditions are unstable and there is not much competition from other species of fish. Green sunfish are very tolerant of extremes of turbidity, dissolved oxygen, temperature and flow and are well suited to the fluctuating environment of drainage ditches. They are generally distributed in the Cahokia Drainage Area. They are not highly regarded as sport fish because they usually do not grow as large as bluegill.

Orangespotted sunfish reach a maximum length of about four inches. They are most common in the Prairie Regions of Missouri and Illinois and are tolerant of siltation and continuous high turbidity. They are often found in habitats with low or intermittent flow and may serve as a forage fish for largemouth bass. They are generally present in small numbers but were the most abundant fish in the site 11 collection.

Bluegill is a wide ranging species extremely tolerant of environmental modification and are typically abundant in flood plain habitats. Bluegill are prone to overpopulate but are highly regarded as a panfish. Small bluegill are important as forage for bass. Bluegill are somewhat intolerant of continuous high turbidity and thrive best in clear warm waters where some vegetation is present. Bluegill require much the same conditions as largemouth bass and a good population of bluegill usually means a good bass population. Excessively abundant bluegill may adversely affect bass reproduction, but this does not seem to be the case here.

Largemouth bass is a wide ranging species considered a very desirable sport fish. There is healthy bass production in the area. Several schools of young of the year bass were seen at site 11 and one adult female captured. Local people said that adult bass were common there. Scattered juvenile bass were taken throughout the area. All were in good condition. Bass requirements are similar to those given for the bluegill. Small bass were also present at sites 17 and 20.

GENERAL COMMENTS ON THE AREA

The collections obtained for this environmental inventory reveal nothing which is particularly unexpected. The small hillside streams, Judy's Branch (site 8), Burdick Branch (site 7), Schoolhouse Branch (site 5), and Canteen Creek (site 14) have five to seven species present and about thirteen pounds standing crop per acre, but species and number of fishes are low in comparison to what would be expected from larger hillside streams of the region (Cahokia Creek, Piasa Creek, Wood River Creek, Prairie du Pont Creek). Bigmouth shiners, sand shiners, red shiners, and bluntnose minnows, which are dominant elements in the larger creeks, are absent or present in low numbers. This reflects the small size and unstable nature of the smaller streams perhaps as much as it reflects man-made degradation of the streams. Fathead minnows and creek chubs are hardier elements of this fauna and are able to tolerate stagnant pools, low oxygen levels, siltation and higher temperatures which characterize these smaller streams, better than the other species listed above.

Sites in the Cahokia Canal itself (sites 1, 2, 4, 6, 9) have seven to ten species present. Gizzard shad, carp and small sunfishes were dominant at the lower sites; site 9 is more of a swamp lake and was dominated by shortnose gar and black bullheads. Sites 1 and 6 were very low when sampled and this is reflected in low pounds per acre. Pounds per acre at site 9 are low, probably reflecting both periods of very low DO and also the difficulty of setting block nets due to many

snags. Ditches like the Cahokia Canal are never very productive as they offer little habitat diversity. They may, however, temporarily contain large numbers of fishes which move in during spring floods.

Fathead minnows were common at sites 3, 4, 5, 6, 10, 12 and 13 which indicates that these sites are subject to considerable stress from low DO and/or high temperatures from time to time. Abundance of bowfin at site 10 is a similar indication. Site 11 (Long Lake) is probably in better shape than the collection indicates, as considerable difficulty was experienced with snags there. Schools of juvenile large mouth bass and black bullheads were observed in Long Lake on several occasions during the summer and many orangespotted sunfish were seen breeding there.

In general, fishes collected in the Cahokia Drainage Area were in good condition and Long Lake, Mitchell Ditch and other areas in the basin serve as breeding and nursery areas for such species as large mouth bass, the smaller sunfishes, black bullheads, carp and perhaps carpsuckers. The fauna in the area is depauperate with mostly wide ranging hardy species. However, the area around Horseshoe Lake does not show the same sort of fishery problems (low reproduction, poor condition) seen in Horseshoe Lake and it is reasonable to regard the Horseshoe Lake problems as localized, rather than a reflection of the state of the fish fauna of the whole drainage area.

Cahokia Diversion Channel (sites 15, 16, 17) appears to improve downstream. Site 15 values are probably low due to snags and loss of

shocked fish in turbid water. Site 17 is high in that some fishes were inadvertently included which were caught on the outside of the block nets. The fauna is dominated by gizzard shad, carp and suckers.

The Chain of Rocks fauna includes several big river species, hiodons and skipjack herring, for example. No smaller minnow species were taken although one small mesh gill net was used. Number of species taken and catch per unit effort both increased downstream.

As expected, diversity values are generally low for collections for the Cahokia Drainage area where collections are dominated by one to three species. Some evenness values are unusually high but this is a reflection of small sample size. The highest diversity value was seen at site 20 in the Chain of Rocks Canal.

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SECTION IX

BIOLOGICAL ELEMENTS
TERRESTRIAL VEGETATION

PREPARED BY

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METHODOLOGY

U. S. Geological Survey topographic maps (1954, photorevised 1968) were studied in an attempt to locate the most important woods in the study area; that is, those woods which were significantly large and located in proximity to proposed flood control structures. Those woods which were chosen from U.S.G.S. maps were then located on infra-red aerial photographs (NASA, September, 1974) and their existence, location, and size were verified and updated. Ultimately, ground observation was resorted to in order to verify the information which had been obtained from map studies and to reduce the number of woods to be studied to a reasonable number (ten).

MATERIALS AND METHODS

The woods ultimately chosen were studied by square quadrats located along transects. The quadrats were fifty feet on a side for overstory vegetation, fifty feet on a side for understory vegetation and five feet on a side for ground cover. Eight such quadrats were located along a transect in each woods. The first quadrat was located at the edge of the woods and subsequent ones were located 150 feet apart along the transect. Identification, binomials, and common names were obtained with the use of Gray's Manual (Fernald, 1950), Flora of Illinois (Jones, 1963), and Flora of Missouri (Steyermark, 1963). A discussion of terrestrial vegetation of the American Bottoms in St. Clair County, Illinois, immediately south of and contiguous with the study area was given by Kulfinski (1973).

LOCATIONS OF FLOODPLAIN WOODS*

Woods 1 was located approximately one-half the distance between Highway 162 and Collinsville-Granite City Road at a point east of Highway 111 and southwest of KMOX Radio tower. It was located behind (east of) a roofing company warehouse. The transect ran in a northeasternly direction from the rear (east) of the roofing company property.

Woods 2 was located to the west of the road along the northwest side of McDonough Lake. The transect was oriented in an east-west direction and it extended westward, half the distance toward Cahokia Canal, from the homesites along the road.

Woods 3 was located three-fourths of a mile north of the Black Lane-Interstate 70 intersection and east of the Cahokia Canal levee. The transect ran eastward from the levee.

Woods 4 was located at two sites on Walker Island. A four quadrat transect was run in a north-south direction in a woods segment on the west central side of the island. Four more quadrats were run in a north-east-southwest transect to a former home site at the south end of the island.

Woods 5 was located near the southeast end of Long Lake. It was east of Long Lake, south of Highway 162, and west of Cahokia Canal.

Woods 6 was located along Cahokia Creek south of New Poag Road and west of the Southern Illinois University at Edwardsville Campus. The transect ran nearly in a north-south direction.

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*All figures referred to are located in Volume 6 of 6 of this Environmental Inventory Report.

Woods 7 was located north of a golf course and approximately one mile south of Highway 162. It was at the southeast end of Long Lake and adjacent to the west side of the Cahokia Canal. The transect ran approximately in a north-south direction.

Woods 8 was located at the southeast corner of the junction of Highway 111 and New Poag Road and was diagonally bisected by the Penn Central Railroad. The transect was located in the eastern half of the woods and it was east-west oriented.

Woods 9 was located one mile south of Lewis and Clark State Memorial Park. It was between the Illinois Terminal Railroad and Highway 3 to the east and the Chain of Rocks Canal to the west. The woods was bisected by a utility line into northwest and southeast halves. The transect ran north-south through the southeastern half.

Woods 10 was located about one mile south of Highway 162 and about one and one-half miles north of the Collinsville-Granite City Road. It was located southeast of the KMOX Radio tower and the transect was oriented approximately in a north-south direction.

Woods 1

The data for Woods 1 are presented in Table IX-1. Dominant overstory species on the basis of density were green ash (forty-six), silver maple (fifty-seven), and persimmon (thirty-eight); on the basis of basal area were green ash (thirty-two and three tenths) and silver maple (twenty-five and two tenths); and on the basis of percent of cover were silver maple (nineteen and one tenth), green ash (eighteen and one tenth), and persimmon (thirteen and one tenth).

Table IX-1 Characteristics* of the overstory, understory, and ground cover of Woods 1 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Fraxinus lanceolata	Green Ash		46	32	18.1	63	9.8	16.9	3	.9	1.8
Acer saccharinum	Silver Maple		57	29.2	19.1	34	19.1	8.3			
Populus deltoides	Cottonwood	1	1	8.9	1.9						
Quercus palustris	Pin Oak	1	2	8.8	3.8						
Ulmus americana	American Elm		24	7.3	7.5	5	17.0	1.9	2	1.8	.8
Salix nigra	Black Willow		16	7.0	6.9						
Diospyros virginiana	Persimmon		38	6.5	13.1	3	.6	.3			
Celtis occidentalis	Hackberry		4	3.3	1.3						
Forestiera acuminata	Swamp Privet		5	1.0	1.3	25	9.8	13.8			
Ilex decidua	Deciduous Holly					74	67.0	13.3			
Cephalanthus occidentalis	Buttonbush					31	2.5	6.3			
Cornus drummondii	Roughleaf Dogwood					14	1.3	3.8			
Robinia pseudoacacia	Black Locust					1	1.1	.6			
Hibiscus militaris	Rose Mallow					13	1.0	1.9	16	.9	.6
Symphoricarpos orbiculatus	Coralberry					1	.1	.1			
Graminae sp.	Grass								185	48.5	39.0
Saururus cernuus	Lizard's Tail								17	11.9	4.4
Impatiens capensis	Spotted Touch-me-not								28	10.3	6.9
Solidago sp.	Goldenrod								18	9.1	5.0
Ambrosia trifida	Giant Ragweed								5	3.7	2.5
Rhus radicans	Poison Ivy								12	3.7	2.5
Geum canadense	White Avens								16	2.7	1.5
Vitis sp.	Grape								4	1.8	1.9
Urtica dioica	Stinging Nettle								6	1.1	2.5
Bidens sp.	Beggarticks								3	.9	.6
Rosa sp.	Rose								2	.9	1.9
Carex sp.	Carex								3	.9	1.3
Total		2	193	100.0	73.0	264	100.0	67.2	320	100.0	86.2
% Space					43.8			43.1			33.1

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Dominant understory species on the basis of density were deciduous holly (seventy-four) and green ash (sixty-three); on the basis of percent of basal area were deciduous holly (sixty-seven) and silver maple (nineteen and one tenth); and on the basis of percent of cover were green ash (sixteen and nine tenths), swamp privet (thirteen and eight tenths), and deciduous holly (thirteen and three tenths).

Dominant ground cover species on the basis of density was grass (185), on the basis of percent of basal area was grass (forty-eight and five tenths), and on the basis of percent of cover was grass (thirty-nine).

Nine species made up the overstory, eleven species the understory, and fifteen species the ground cover. The species found were characteristic of flood plain forests, with such species as ash, silver maple, cottonwood, elm, and black willow representing wide-dispersing and quick-germinating species.

Woods 2

The data for Woods 2 are presented in Table IX-2. Dominant overstory species on the basis of density were American elm (forty-seven), pin oak (twenty-five), and green ash (seventeen); on the basis of percent of basal area was pin oak (eighty-seven and six tenths); and on the basis of percent of cover were pin oak (fifty-three and eight tenths), American elm (twenty and six tenths), and green ash (twelve).

Dominant understory species on the basis of density were green ash (twenty-nine), roughleaf dogwood (twenty-eight), deciduous holly

Table IX-2 Characteristics* of the overstory, understory, and ground cover of Woods 2 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Quercus palustris	Pin Oak	16	25	87.6	53.8	1	1.0	.1	3	.7	.4
Fraxinus lanceolata	Green Ash		17	5.0	12.0	29	21.7				
Ulmus americana	American Elm		47	2.9	20.6	25	23.0	6.6			
Diospyros virginiana	Persimmon		7	2.0	5.1						
Acer negundo	Box Elder		11	.7	4.1	3	2.9	1.3			
Celtis occidentalis	Hackberry		7	.6	2.4	2	1.2	.8			
Crataegus sp.	Hawthorn # 1		5	.5	1.3	3	2.9	1.3			
Carya cordiformis	Bitternut Hickory		5	.3	1.9						
Sassafras albidum	Sassafras		4	.2	1.3	1	1.0	.6			
Acer saccharinum	Silver Maple		1	.1	.6	4	2.4	1.5			
Vitis sp.	Grape		2	.0	.0				1	.22	.1
Cornus drummondii	Roughleaf Dogwood					28	11.1	14.6			
Forestiera acuminata	Swamp Privet					12	9.5	2.6			
Lindera benzoin	Spicebush					19	9.1	6.3			
Ilex decidua	Deciduous Holly					26	7.2	1.8			
Rhus radicans	Poison Ivy					13	3.2	2.6	60	36.4	34.4
Asimina triloba	Pawpaw					4	2.4	1.9			
Tilia americana	Basswood					1	1.0	.4			
Impatiens capensis	Spotted Touch-me-not					10	.3	2.5	13	4.3	3.6
Campsis radicans	Trumpet Vine								28	41.6	22.5
Parthenocissus quinquefolia	Virginia Creeper								9	10.4	3.8
Iris sp.	Iris								5	3.5	1.9
Dioscorea sp.	Wild Yam								3	1.1	1.4
Osmorphiza claytoni	Sweet Cicely								4	1.1	.3
Menispermum canadense	Moonvine								2	.9	.6
Total		16	130	100.0	103.2	181	100.0	53.4	125	100.0	68.7
% Space					28.8			50.0			44.4

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

(twenty-six), and American elm (twenty-five); on the basis of percent of basal area were American elm (twenty-three), and green ash (twenty-one and seven tenths); and on the basis of percent of cover were rough-leaf dogwood (fourteen and six tenths), and green ash (eight and four tenths).

Dominant ground cover species on the basis of density were poison ivy (sixty) and trumpet vine (twenty-eight); on the basis of percent of basal area were trumpet vine (forty-one and six tenths) and poison ivy (thirty-six and four tenths); and on the basis of percent of cover were poison ivy (thirty-four and four tenths) and trumpet vine (twenty-two and five tenths).

Eleven species made up the overstory, sixteen species the understory, and ten species the ground cover.

Woods 3

The data for Woods 3 are presented in Table IX-3. Dominant overstory species on the basis of density were silver maple (one hundred and twenty-five) and green ash (thirty-two); and on the basis of percent of basal area were silver maple (fifty-six and six tenths) and green ash (thirty-three); and on the basis of percent of cover were silver maple (seventy) and green ash (twenty-six).

The dominant understory species on the basis of density were spotted touch-me-not (nine hundred) and giant ragweed (thirty); on the basis of basal area was spotted touch-me-not (ninety-two and seven tenths); and on the basis of percent of cover were spotted touch-me-not (eleven and nine tenths), and American elm (four and four tenths).

Dominant ground cover species on the basis of density were grass (one hundred fifty-five), wild water pepper (one hundred fifty), and

Table IX-3 Characteristics* of the overstory, understory, and ground cover of Woods 3 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Acer saccharinum	Silver Maple		125	56.6	70.0	1	.4	.1	3	.2	.8
Fraxinus lanceolata	Green Ash		32	33.0	26.0						
Platanus occidentalis	Sycamore		2	4.0	2.5						
Ulmus americana	American Elm		3	2.2	2.5	10	1.0	4.4	2	.2	.8
Salix nigra	Black Willow		5	1.8	1.3						
Juglans nigra	Black Walnut		1	1.1	3.8						
Acer negundo	Box Elder		1	.4	.6	1	.1	.6			
Morus alba	White Mulberry		2	.4	.6						
Campsis radicans	Trumpet Vine		15	.4	.6	10	1.0	4.8			
Diospyros virginiana	Persimmon		1	.0	.3						
Prunus serotina	Black Cherry		1	.0	.1						
Impatiens capensis	Spotted Touch-me-not					900	92.7	11.9	88	6.2	11.3
Ambrosia trifida	Giant Ragweed					30	3.1	1.8	11	5.8	5.7
Celtis occidentalis	Hackberry					1	1.6	.6	1	.1	.6
Graminae sp.	Grass								155	21.5	15.6
Polygonum hydropiperoides	Wild Water Pepper								150	13.7	8.8
Boehmeria cylindrica	False Nettle								35	11.7	11.9
Bidens sp.	Beggarticks								40	7.3	8.8
Solidago sp.	Goldenrod								32	6.2	10.6
Ambrosia artemisiifolia	Common Ragweed								9	5.8	5.0
Urtica dioica	Stinging Nettle								9	5.8	3.8
Rhus radicans	Poison Ivy								27	4.7	5.0
Galinsoga ciliata	Galinsoga								41	3.6	7.5
Desmodium sp.	Tick Trefoil								12	3.3	1.9
Cephalanthus occidentalis	Buttonbush								2	3.3	1.3
Dactylis glomerata	Orchard Grass								72	2.2	9.4
Phytolacca americana	Pokeweed								5	1.8	2.5
Geum canadense	White Avens								8	1.5	1.3
Vitis sp.	Grape								3	.5	.8
Eragrostis spectabilis	Love Grass								2	.4	.6
Labiatae sp.	Mint								2	.4	.6
Total		0	188	100.0	108.4	953	100.0	24.3	709	100.0	114.6
% Space					23.1			78.5			23.0

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

spotted touch-me-not (eighty-eight); on the basis of percent of basal area were grass (twenty-two and five tenths), wild water pepper (thirteen and seven tenths), and false nettle (eleven and seven tenths); and on the basis of percent of cover were grass (fifteen and six tenths), false nettle (eleven and nine tenths), spotted touch-me-not (eleven and three tenths), goldenrod (ten and six tenths), and orchard grass (nine and four tenths).

Eleven species were found in the overstory, seven in the understory, and twenty-two in the ground cover.

Woods 4

The data for Woods 4 are presented in Table IX-4. Dominant overstory species on the basis of density were silver maple (seventy-one) and black willow (seventy); on the basis of percent of basal area were black willow (sixty-five and six tenths) and silver maple (twenty-one); and on the basis of percent of cover were black willow (twenty-nine and four tenths), silver maple (fourteen and four tenths), and green ash (fourteen and four tenths).

Dominant understory species on the basis of density was silver maple (5018); on the basis of percent of basal area was silver maple (seventy-seven and four tenths); and on the basis of percent of cover was silver maple (thirty-six and three tenths).

Dominant ground cover species on the basis of density were silver maple (753) and beggartick (156); on the basis of percent of basal area was silver maple (seventy-four and two tenths); and on the basis of percent of ground cover was silver maple (twenty and one tenth).

In Woods 4, twelve species made up the overstory, ten species the

Table IX-4 Characteristics* of the overstory, understory, and ground cover of Woods 4 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Salix nigra	Black Willow	1	70	65.6	29.4	2	.0	.6			
Acer saccharinum	Silver Maple	3	71	21.0	14.4	5018	77.4	36.3	753	74.2	20.1
Fraxinus lanceolata	Green Ash		36	9.8	14.4	18	.5	3.9			
Diospyros virginiana	Persimmon		18	1.4	1.9	8	.4	2.5			
Forestiera acuminata	Swamp Privet		14	.6	2.5	21	2.8	10.0			
Betula nigra	River Birch		2	.5	1.9						
Populus deltoides	Cottonwood		2	.5	1.3						
Vitis sp.	Grape		15	.3	1.3				7	1.7	2.6
Ulmus americana	American Elm		1	.3	1.3						
Crataegus sp.	Hawthorn # 1		8	.1	1.5						
Cephalanthus occidentalis	Buttonbush		1	.0	.6	20	.6	6.9	2	1.3	.6
Acer negundo	Box Elder		2	.0	1.3						
Bidens sp.	Beggartick					120	9.2	4.2	156	6.6	5.0
Solidago sp.	Goldenrod					120	9.2	4.2			
Phytolacca americana	Pokeweed					2	.1	.9	3	1.3	.6
Lobelia cardinalis	Cardinal Flower					1	.0	.6			
Polygonum hydropiperoides	Wild Water Pepper								25	5.3	6.3
Campsis radicans	Trumpet Vine								3	5.3	1.3
Laportea canadensis	Wood Nettle								10	1.7	2.4
Graminae sp.	Grass								20	1.3	1.3
Viola sp.	Violet								12	1.3	1.9
Total		4	240	100.0	70.5	5330	100.0	70.1	991	100.0	42.2
% Space					39.4			41.9			61.3

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

understory, and ten species the ground cover.

Woods 5

The data for Woods 5 are presented in Table IX-5. Dominant overstory species on the basis of density were bur oak (sixty-four), pin oak (thirty-two), and hawthorn (thirty-one); on the basis of percent of basal area were pin oak (fifty and three tenths) and bur oak (thirty-two and five tenths); and on the basis of percent of cover were bur oak (forty and eight tenths) and pin oak (thirty-eight and one tenth).

Dominant understory species on the basis of density were trumpet creeper (twenty-one) and hawthorn (twelve); on the basis of percent of basal area were hawthorn No. one (twenty-one and eight tenths), hawthorn No. two (thirteen and seven tenths), and deciduous holly (ten and five tenths); and on the basis of percent of cover were trumpet creeper (three and one tenth), poison ivy (two and nine tenths), and hawthorn (two).

Dominant ground cover species on the basis of density were grass No. one (1500), grass No. two (650), poison ivy (600), and trumpet creeper (500); on the basis of percent of basal area were sedge (twenty and nine tenths), trumpet creeper (fifteen and two tenths), jewelweed (ten and six tenths), and green ash (nine and one tenth); and on the basis of percent of cover were galinsoga (ten), poison ivy (ten), and sedge (eight and eight tenths).

The overstory was made up of fourteen species, the understory of seventeen species, and the ground cover of twenty-seven species.

Table IX-5 Characteristics* of the overstory, understory, and ground cover of Woods 5 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Quercus palustris	Pin Oak	5	32	50.3	38.1	6	3.9	.5	7	1.1	.2
Quercus macrocarpa	Bur Oak	4	64	32.5	40.8	7	4.6	.9	15	1.4	.6
Quercus imbricaria	Shingle Oak		16	5.8	7.5						
Ulmus americana	American Elm		12	2.7	5.8	4	8.5	1.6	14	1.1	.6
Diospyros virginiana	Persimmon		15	2.2	4.1	5	8.5	.8	15	.6	.3
Crataegus sp.	Hawthorn # 1		31	1.8	8.1	12	21.8	1.0			
Juglans nigra	Black Walnut		2	1.5	1.3						
Carya cordiformis	Bitternut Hickory		3	.2	.8	1	.2	.1			
Gleditsia triacanthos	Honey Locust		2	.9	3.3				35	1.1	1.3
Celtis occidentalis	Hackberry		3	.4	1.0	2	3.2	.6			
Acer saccharinum	Silver Maple		3	.3	1.9	1	.7	.1	10	1.1	.8
Fraxinus lanceolata	Green Ash		9	.2	.8	11	8.7	1.0	75	9.1	.1
Vitis sp.	Grape		3	.3	1.1				55	2.6	3.4
Cercis canadensis	Redbud		7	.2	3.1	1					
Crataegus sp.	Hawthorn # 2					9	13.7	2.0			
Ilex decidua	Deciduous Holly					8	10.5	1.4			
Rhus radicans	Poison Ivy					8	9.2	2.9	600	5.7	10.0
Campsis radicans	Trumpet Creeper					21	3.5	3.1	500	15.2	3.8
Cornus drummondii	Roughleaf Dogwood					5	1.8	.4	15	1.4	.8
Phytolacca americana	Pokeweed					3	.5	.1			
Sambucus canadensis	Elderberry					1	.2	.1			
Cyperaceae sp.	Sedge								150	20.9	8.8
Impatiens pallida	Jewelweed								120	10.6	.5
Parthenocissus quinquefolia	Virginia Creeper								130	5.7	3.0
Galinsoga ciliata	Galinsoga								80	4.9	10.0
Boehmeria cylindrica	False Nettle								65	4.6	2.5
Graminae	Grass # 1								1500	2.8	1.1
Polygonum convolvulus	Black Bindweed								45	1.4	.3
Lindera benzoin	Spicebush								5	1.1	.3
Dioscoria sp.	Wild Yam								15	1.1	.1
Chenopodium album	Lambs Quarters								25	1.1	1.3
Graminae	Grass # 2								650	1.1	.1
Celastrus scandens	Bittersweet								25	1.1	.6
Osmorhiza longistylis	Sweet Cicely								225	1.1	.4
Smilax herbacea	Greenbriar								100	1.1	.6
Rubus flagellaris	Dewberry								35	.3	.1
Desmodium sp.	Tick Trefoil								50	.3	.1
Solidago sp.	Goldenrod								70	.3	.4
Total		9	202	100.0	117.7	105	100.0	16.8	4631	100.0	52.0
% Space					25.0			87.0			50.0

*Characteristics

\# = number per 20,000 square feet in overstory and understory

\# = number per 200 square feet in ground cover

% dominance = % basal area

% cover = % of quadrat area covered (shaded) by foliage

% space = % of quadrat area exposed to direct sunlight

Woods 6

The data for Woods 6 are presented in Table IX-6. Dominant overstory species based on density were hackberry (thirty-six), box elder (thirty-one), American elm (thirty-one), and silver maple (twenty); based on percent of basal area were silver maple (thirty-one and three tenths), hackberry (fifteen and eight tenths), and sycamore (fifteen); and on the basis of percent of cover were hackberry (thirty-one and nine tenths), silver maple (sixteen and nine tenths), and black walnut (sixteen and nine tenths).

Dominant understory species based on density were spicebush (twenty-six), bladdernut (twenty-four), hackberry (twenty-three), box elder (twenty-three), and American elm (twenty-two); on the basis of percent of basal area were hackberry (twenty-one), green ash (seventeen and eight tenths), roughleaf dogwood (sixteen and two tenths), and on the basis of percent of cover were spicebush (eleven and nine tenths), hackberry (nine and four tenths), and bladdernut (nine).

Dominant ground cover species based on density were grass (315) and wild rye (215); based on percent of basal area were grass (nineteen), wild rye (twelve), spotted touch-me-not (eleven and one tenth), and Virginia creeper (ten and two tenths); and based on percent of cover were grass (twenty) and sedge (twenty).

The overstory was made up of fifteen species, the understory of thirteen species, and the ground cover of twenty species.

Table IX-6 Characteristics* of the overstory, understory, and ground cover of Woods 6 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Acer saccharinum	Silver Maple	3	20	31.3	16.9						
Celtis occidentalis	Hackberry	2	36	15.8	31.9	23	21.0	9.4			
Platanus occidentalis	Sycamore	1	1	15.0	3.1						
Quercus macrocarpa	Bur Oak	1	9	8.8	8.8	3	1.5	.4			
Juglans nigra	Black Walnut		13	8.6	16.9						
Fraxinus lanceolata	Green Ash		16	6.2	11.9	10	17.8	4.5			
Acer negundo	Box Elder		31	5.8	12.5	23	11.0	6.4			
Ulmus americana	American Elm		31	4.2	12.5	22	8.3	6.9			
Quercus palustris	Pin Oak		1	1.3	2.5						
Populus deltoides	Cottonwood		1	1.1	1.3						
Morus alba	White Mulberry		1	.6	1.3	3	.5	.4			
Carya cordiformis	Bitternut Hickory		3	.6	3.1	1	.5	.1			
Cercis canadensis	Redbud		2	.5	.8						
Asimina triloba	Pawpaw		7	.2	.8	18	7.4	6.5			
Vitis sp.	Grape		5	.2	3.1				2	.4	.6
Cornus drummondii	Roughleaf Dogwood					15	16.2	6.3			
Lindera benzoin	Spicebush					26	8.0	11.9			
Staphylea trifolia	American Bladdernut					24	4.1	9.0			
Tilia americana	Basswood					2	2.5	.3			
Rhus radicans	Poison Ivy					2	1.0	.6			
Graminae sp.	Grass								315	19.0	20.0
Elymus arenarius	Wild Rye								215	12.0	11.3
Impatiens capensis	Spotted Touch-me-not								35	11.1	10.6
Parthenocissus quinquefolia	Virginia Creeper								28	10.2	11.3
Geum canadense	White Avens								68	9.7	8.1
Cyperaceae sp.	Sedge								65	7.1	20.0
Asarum canadense	Wild Ginger								30	5.8	3.8
Viola sp.	Violet								23	5.8	3.1
Blephilia hirsuta	Hairy Wood Mint								36	4.4	2.5
Smilax herbacea	Greenbriar								10	2.8	4.4
Urtica dioica	Stinging Nettle								35	2.2	3.8
Campanula americana	Tall Bellflower								10	1.7	1.9
Eupatorium fistulosum	Joe Pye Weed								5	1.7	6.3
Asimina triloba	Pawpaw								5	1.7	1.3
Chenopodium album	Lambsquarters								3	1.7	1.3
Menispermum canadense	Moonvine								5	1.1	3.5
Campsis radicans	Trumpet Vine								2	.4	.6
Rosa sp.	Rose								1	.4	.1

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Table IX-6 (con't) Characteristics* of the overstory, understory, and ground cover of Woods 6 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Oxalis dillenii	Wood sorrel								1	.4	.1
Arisaema dracontium	Greendragon								1	.2	.1
Total		7	177	100.0	127.3	172	100.0	62.7	895	100.0	114.9
% Space					24.0			44.0			32.0

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Woods 7

The data for Woods 7 are presented in Table IX-7. Dominant species based on density were American elm (fifty-two), box elder (twenty-eight), and grape (twenty-five); based on percent of basal area were bur oak (twenty-eight and eight tenths), green ash (twenty-seven and two tenths), hackberry (sixteen and six tenths), and American elm (eleven and one tenth); and based on percent of cover were many species including hackberry (twenty-three and one tenth), green ash (twenty and six tenths), American elm (eighteen and eight tenths), grape (eighteen and one tenth), box elder (sixteen and three tenths), silver maple (thirteen), black walnut (eleven and three tenths), and bur oak (ten and six tenths).

Dominant understory species based on density were box elder (forty-two), American elm (twenty-six), and poison ivy (twenty-two); based on percent of basal area were American elm (thirty-two and two tenths), box elder (nineteen and four tenths), silver maple (fourteen and eight tenths), and hackberry (fourteen and three tenths); and based on percent of cover were box elder (eight and eight tenths), American elm (eight and one tenth), and poison ivy (six and nine tenths).

Dominant ground cover species based on density were poison ivy (325), grass (250), stinging nettle (170), and bellflower (106); based on percent of basal area were poison ivy (thirty-three and eight tenths), stinging nettle (fifteen and four tenths), and trumpet vine (eleven); and based on percent of cover were poison ivy (thirty-one and nine tenths), stinging nettle (twenty-one and three tenths), and spotted touch-me-not (twenty).

Table IX-7 Characteristics* of the overstory, understory, and ground cover of Woods 7 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Quercus macrocarpa	Bur Oak	2	12	28.8	10.6	3	.8	.6			
Fraxinus lanceolata	Green Ash	1	16	27.2	20.6	7	4.5	3.1			
Celtis occidentalis	Hackberry		15	16.6	23.1	11	14.3	3.8			
Ulmus americana	American Elm		52	11.1	18.8	26	32.2	8.1			
Acer negundo	Box Elder		28	6.2	16.3	42	19.4	8.8			
Juglans nigra	Black Walnut		5	4.8	11.3						
Vitis sp.	Grape		25	3.5	18.1				18	1.8	3.3
Cornus drummondii	Rougleaf Dogwood		17	1.3	6.9	15	7.5	4.5			
Acer saccharinum	Silver Maple		4	.5	13.0	5	14.8	1.1			
Gymnocladus dioicus	Kentucky Coffee Tree		2	.1	.6	3	1.1	1.3			
Smilax herbacea	Greenbriar		5	.0	2.5						
Rhus radicans	Poison Ivy					22	5.1	6.9	325	33.8	31.9
Euonymus atropurpureus	Wahoo					2	.4	.6			
Campsis radicans	Trumpet Vine					2	.4	.6	44	11.0	10.6
Urtica dioica	Stinging Nettle								170	15.4	21.3
Silphium perfoliatum	Cup Plant								26	8.7	6.9
Impatiens capensis	Spotted Touch-me-not								55	7.3	10.6
Campanula americana	Tall Bellflower								106	7.3	20.0
Graminae sp.	Grass								250	6.4	13.1
Parthenocissus quinquefolia	Virginia Creeper								20	2.9	3.0
Cyperaceae sp.	Sedge								23	1.5	2.6
Solidago sp.	Goldenrod								30	.9	2.5
Galinsoga ciliata	Galinsoga								12	.7	1.5
Ambrosia trifida	Giant Ragweed								11	.7	2.5
Menispermum canadense	Moonvine								7	.6	1.2
Desmodium sp.	Tick Trefoil								7	.6	.8
Teucrium canadense	Wood Sage								1	.3	.1
Smilax herbacea	Greenbriar								4	.3	1.3
Total		3	181	100.0	141.8	138	100.0	39.5	1109	100.0	133.3
% Space					18.0			60.2			16.9

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Overstory was made up of eleven species, understory of eleven species, and ground cover of seventeen species.

Woods 8

The data for Woods 8 are presented in Table IX-8. Dominant species of the overstory of Woods 8 based on density were hawthorn No. one (eighty-five) and persimmon (sixty-six); based on percent of basal area were pin oak (seventy-six and six tenths) and persimmon (twelve and seven tenths); and based on percent of cover were sassafras (thirty-five), pin oak (thirty), and hawthorn No. one (twenty-six).

Dominant species of the understory based on density were roughleaf dogwood (ninety-one), spicebush (forty-five), and hawthorn No. one (forty-three); based on percent of basal area were hawthorn No. one (fifty-three and six tenths), spicebush (twenty-three), and roughleaf dogwood (fifteen and eight tenths); and based on percent of cover were roughleaf dogwood (twenty-three), hawthorn No. one (sixteen), and spicebush (fourteen).

Dominant species of the ground cover based on density were poison ivy (sixty-four), Virginia knotweed (forty-eight), and rough avens (twenty-nine); based on percent of basal area was poison ivy (thirty-nine and four tenths); and based on percent of cover were poison ivy (seventeen), Virginia knotweed (eleven), Virginia creeper (ten and two tenths), and rough avens (nine).

Overstory was made up of seven species, understory of eight species, and ground cover of eight species.

Table IX-8 Characteristics* of the overstory, understory, and ground cover of Woods 8 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Quercus palustris	Pin Oak	11	14	76.6	30.0	8	3.4	4.0			
Diospyros virginiana	Persimmon		66	12.7	7.0						
Crataegus sp.	Hawthorn # 1		85	6.7	26.0	43	53.6	16.0			
Ulmus americana	American Elm		21	3.1	10.6	13	1.6	7.0			
Sassafras albidum	Sassafras		16	.8	35.0	11	1.4	6.0			
Vitis sp.	Grape		14	.2	11.0				5	9.3	3.0
Morus rubra	Mulberry		2	.1	.7						
Lindera benzoin	Spicebush					45	23.0	14.0			
Cornus drummondii	Roughleaf Dogwood					91	15.8	23.0			
Ilex decidua	Deciduous Holly					6	.8	3.0			
Celtis occidentalis	Hackberry					3	.4	1.0			
Rhus radicans	Poison Ivy								64	39.4	17.0
Polygonum virginianum	Virginia Knotweed								48	13.9	11.0
Parthenocissus quinquefolia	Virginia Creeper								18	13.9	10.2
Geum laciniatum	Rough Avens								29	11.6	9.0
Ambrosia trifida	Giant Ragweed								22	6.9	3.4
Menispermum canadense	Moonvine								8	4.6	6.0
Galinsoga ciliata	Galinsoga								3	.6	1.0
Total		11	218	100.0	120.3	220	100.0	74.0	197	100.0	60.6
% Space					30.0			45.0			46.0

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Woods 9

The data for Woods 9 are presented in Table IX-9. Dominant overstory species based on density was American elm (163); based on percent of basal area were pin oak (fifty-five and nine tenths), American elm (twenty-one and five tenths), and overcup oak (fifteen); and based on percent of cover were American elm (forty-three and one tenth), pin oak (twenty-three and one tenth), and overcup oak (ten).

Dominant understory species based on density were roughleaf dogwood (sixty-eight), poison ivy (sixty), and American elm (thirty-four); based on percent of basal area were American elm (thirty-eight and nine tenths), roughleaf dogwood (eighteen and five tenths), and poison ivy (sixteen and eight tenths); and based on percent of cover were poison ivy (sixteen), roughleaf dogwood (fourteen and four tenths), deciduous holly (eleven and three tenths), and American elm (ten).

Dominant ground cover species based on density were poison ivy (seventy-six), and grass (sixty); based on percent of basal area were poison ivy (fifty-four and six tenths), grass (sixteen and four tenths), and trumpet vine (eleven and eight tenths); and based on percent of cover were poison ivy (thirty one and three tenths) and bedstraw (ten).

The overstory was made up of nine species, the understory of eleven species, and the ground cover of eighteen species.

Woods 10

The data for Woods 10 are presented in Table IX-10. The dominant overstory species based on density were silver maple (seventy), green ash (fifty-two), grape (twenty-eight) and American elm (twenty-four);

Table IX-9 Characteristics* of the overstory, understory, and ground cover of Woods 9 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Quercus palustris	Pin Oak	5	28	55.9	23.1						
Ulmus americana	American Elm		163	21.5	43.1	34	38.9	10.0	1	.2	.9
Quercus lyrata	Overcup Oak	2	12	15.0	10.0	3	.6	1.8			
Fraxinus lanceolata	Green Ash		11	4.8	5.6	11	5.5	4.4	1	.2	.6
Celtis laevigata	Sugarberry		2	1.3	1.3						
Diospyros virginiana	Persimmon		8	1.1	3.9	1	.3	.5	1	.2	.1
Celtis occidentalis	Hackberry		2	.2	1.3	1	.3	.4			
Acer saccharinum	Silver Maple		1	.2	.6						
Vitis sp.	Grape		2	.0	.6				2	.9	1.3
Cornus drummondii	Roughleaf Dogwood					68	18.5	14.4			
Rhus radicans	Poison Ivy					60	16.8	16.0	76	54.6	31.3
Crataegus sp.	Hawthorn # 2					3	9.9	.9			
Ilex decidua	Deciduous Holly					23	6.5	11.3			
Ambrosia trifida	Giant Ragweed					6	1.7	.9	2	.2	.1
Juglans nigra	Black Walnut					1	1.1	.4			
Graminae sp.	Grass								60	16.4	5.6
Campsis radicans	Trumpet Vine								11	11.8	5.6
Cyperaceae sp.	Sedge								3	3.6	.6
Umbelliferae sp.	Umbellifer								12	3.8	3.8
Galium aparine	Bedstraw								14	2.1	10.0
Galinsoga ciliata	Galinsoga								17	1.8	2.5
Bidens sp.	Beggarticks								4	1.1	1.9
Campanula americana	Tall Bellflower								2	.9	.6
Menispermum canadense	Moonvine								3	.9	1.9
Impatiens capensis	Spotted Touch-me-not								5	.9	1.9
Geum canadense	White Avens								1	.2	.6
Viola sp.	Violet								3	.2	1.3
Total		7	229	100.0	89.6	211	100.0	54.9	218	100.0	70.8
% Space					38.8			51.9			45.0

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

Table IX-10 Characteristics* of the overstory, understory, and ground cover of Woods 10 (Figure VI-1). Overstory and understory data are from eight quadrats, each 2,500 square feet. Ground cover data are from eight quadrats, each 25 square feet.

Binomial	Common Name	Trees > 18" dbh	OVERSTORY			UNDERSTORY			GROUND COVER		
			# Density	% Dominance	% Cover	# Density	% Dominance	% Cover	# Density	% Dominance	% Cover
Acer saccharinum	Silver Maple		70	46.3	33.1	9	9.2	6.3			
Ulmus americana	American Elm		24	25.7	11.3	11	8.0	5.6			
Fraxinus lanceolata	Green Ash		52	19.5	26.9	43	24.3	8.8			
Salix nigra	Black Willow		11	8.2	6.3						
Vitis sp.	Grape		28	.4	6.3				3	.8	1.3
Rhus radicans	Poison Ivy					135	32.1	30.0	65	20.7	23.1
Cornus drummondii	Roughleaf Dogwood					43	15.4	7.3			
Dactylis glomerata	Orchard Grass					37	4.6	1.3			
Fraxinus americana	White Ash					2	3.9	2.5			
Ilex decidua	Deciduous Holly					3	2.7	1.3			
Dactylis glomerata	Orchard Grass								40	15.1	9.4
Graminae sp.	Grass								106	14.4	14.3
Impatiens capensis	Spotted Touch-me-not								54	13.6	16.3
Urtica dioica	Stinging Nettle								27	10.0	5.0
Solidago sp.	Goldenrod								37	9.9	13.3
Chenopodium alba	Lambsquarters								4	7.6	1.3
Parthenocissus quinquefolia	Virginia Creeper								9	3.2	3.1
Scutelaria laterifolia	Skullcap								12	1.7	5.0
Saururus cernuus	Lizard's Tail								9	1.5	1.3
Geum canadense	White Avens								4	.8	.1
Bidens sp.	Beggarticks								6	.8	1.3
Total		0	185	100.0	83.9	283	100.0	63.1	376	100.0	94.8
% Space					36.9			51.3			20.6

*Characteristics
= number per 20,000 square feet in overstory and understory
= number per 200 square feet in ground cover
% dominance = % basal area
% cover = % of quadrat area covered (shaded) by foliage
% space = % of quadrat area exposed to direct sunlight

based on percent of basal area were silver maple (forty-six and three tenths), American elm (twenty-five and seven tenths), and green ash (nineteen and five tenths); and based on percent of cover were silver maple (thirty-three and one tenth), green ash (twenty-six and nine tenths), and American elm (eleven and three tenths).

Dominant understory species based on density were poison ivy (135), green ash (forty-three), roughleaf dogwood (forty-three), and orchard grass (thirty-seven); based on percent of basal area were poison ivy (thirty-two and one tenth), green ash (twenty-four and three tenths), and roughleaf dogwood (fifteen and four tenths); and based on percent of cover was poison ivy (thirty).

Dominant ground cover species based on density were grass (106), poison ivy (sixty-five), spotted touch-me-not (fifty-four); based on percent of basal area were poison ivy (twenty-three and one tenth), orchard grass (fifteen and one tenth), grass (fourteen and four tenths), and spotted touch-me-not (thirteen and six tenths); and based on percent of cover were poison ivy (twenty-three and one tenth), spotted touch-me-not (sixteen and three tenths), grass (fourteen and three tenths), and goldenrod (thirteen and three tenths).

The overstory contained five species, understory eight species, and ground cover thirteen species.

GENERAL

The number of overstory species ranges from five in Woods 10 through fifteen in Woods 6 (Table IX-11). Understory species range from seven in Woods 3 through seventeen in Woods 5. Ground cover species range from eight in Woods 8 through twenty-eight in Woods 5.

Table IX-11

Number of All Species and Sizes of Trees
Found in Woods 1 through 10 per 20,000 Square Feet (8 quadrats)

Characteristics	Woods									
	1	2	3	4	5	6	7	8	9	10
Overstory Species	9	11	11	12	14	15	11	7	9	5
Understory Species	11	16	7	10	17	13	11	8	11	8
Ground Cover Species	15	10	22	10	28	21	17	8	18	13
Total Species	27	25	31	21	38	40	28	17	27	21
Trees over 18" dbh	2	16	0	4	9	7	3	11	7	0

Total species range from seventeen in Woods 8 through forty in Woods 6. No relationship between number of species and presence of large trees over eighteen inches dbh was found. There were no individuals over eighteen inches dbh in Woods 3 and 10 ranging to sixteen large individuals in Woods 2 (per 20,000 square feet). Table IX-12 indicates ten dominant overstory species in the ten woods. Of these species, pin oak had the greatest cumulative basal area and was a dominant in four of the ten woods; silver maple was second in basal area and was a dominant in five of the woods; and green ash was third in basal area and was dominant in four of the woods. The remaining seven species were lower in basal area and in the frequency of their dominance.

The data indicate that the woods are generally dominated by flood plain species, as might be expected. The woods have all been cleared, cultivated and allowed to re-grow. Of the ten dominant species, green ash, silver maple, black willow, sycamore, and American elm are all wind disseminated species and are consequently characteristic pioneer flood plain species, being carried, germinating, and developing rapidly on bare wet soils. The remaining species of pin oak, bur oak, persimmon, hackberry, and overcup oak are characteristic of climax or of later successional stages. These are all large-seeded species whose seeds are disseminated by water, gravity, or small animals and are not generally present on bare soil surface but are usually carried in after pioneer forests have developed.

Table IX-12

Dominant Overstory Species Based on Percent
Basal Area in Each of 10 Selected Woods in the Study Area

Species	Woods										Cumulative Percentage
	1	2	3	4	5	6	7	8	9	10	
Green Ash	32.3		33.0				27.2			19.5	112.0
Silver Maple	25.2		56.6	21.0		31.3				46.3	180.4
Pin Oak		87.6			50.3			76.6	55.9		230.4
Black Willow				65.6							65.6
Bur Oak					32.5		28.8				61.3
Hackberry						15.8	16.6				32.4
Sycamore						15.0					15.0
American Elm							11.1		21.5	25.7	58.3
Persimmon								12.7			12.7
Overcup Oak									15.0		15.0
Approximate Elevation (in feet)	405	415	410	405	420	440	415	425	415	410	

A similar floodplain vegetation exists in the American Bottoms of St. Clair County, Illinois, immediately south of the study area reported on herein. Additional information can be found, therefore, in a report by Kulfinski (1973).

GENERAL AND HISTORICAL DEVELOPMENT OF THE FLOODPLAIN

The study area was settled beginning approximately in 1810 with consequent clearing of natural vegetation for agricultural land and for fuel. This trend progressed and development was augmented in the early half of this century with the development of levees and of drainage systems, thereby reducing more areas of natural vegetation to agriculture. The Mississippi Bottoms originally had a vegetation made up of marsh, swamp, and lake wetlands, of bottomland prairie, and of bottomland forest. Present day bottomland forests in the Mississippi Floodplain represent successional communities following destruction of natural forests by man. The succession appears to proceed from willow, to willow-cottonwood, to sugar maple, to pin oak dominated communities, with the last two probably having a considerable admixture of other floodplain species rather than being pure stands.

It is anticipated that the future trends include further drainage and destruction of wetland for agricultural purposes, leaving the remaining wetlands too few, too disturbed and too surrounded by development to function properly as nesting and stopping places for migrating and local waterfowl. It is further anticipated that additional disturbances of forests will occur which will reduce the number of mature

forest communities and will increase the number of early successional communities dominated by willow, cottonwood, and silver maple.

Several species are now found in the study areas, namely prickly-pear cactus, river birch, post oak, and blackjack oak, which were quite numerous in the original vegetation. The same can be said for two prairie sites, one a quarter mile east of Highway 111 and one and one-half miles north of Interstate 270 along the Norfolk and Western Railroad right-of-way and the second within Woods 5 shown in Figure VI-1. It is anticipated that these will decline as further urban, agricultural, transportational, and industrial development continue.

The wetland at Marsh 1 seems to be a large-bird feeding ground and it represents a last remaining remnant of a previously common biological entity. It is expected to go out of existence if the surrounding forest and shrub zones are removed due to alteration of the community and to disturbance of its residents.

UPLAND

The upland of Madison County is a highly dissected series of ridges and stream valleys. The ridge tops are flat and most of these quickly succumbed to agriculture. The land features least developed for agricultural purposes were the steep-walled stream and creek valleys which did not lend themselves to the movement of farm machinery. The ridge tops were vegetated by prairie. Half of Illinois was vegetated by prairies virtually all of which are now gone. Developed below the original ridge prairies were scrub oak-prairie mixtures, then oak-hickory-sugar maple communities, and finally, bottomland forest

consisting of sycamore, green ash, elm, pawpaw, persimmon, hackberry, and a mixture of many other species. The stream banks which became available for colonization by erosion or deposition were vegetated by willow and especially cottonwood and sycamore. Practically nothing is left of the ridge top prairie, whereas bottomland forest still exists in the valleys. Some degree of oak-hickory-sugar maple has also survived. The last remnants of upland prairie have been the bluff top "hill prairies" described by Evers (1955). These were largely on west and south facing slopes which accounted for their dryness and nature and they have been largely destroyed for either pasture in rural areas or home sites in suburban areas.

GENERAL QUALITY AND VIGOR OF VEGETATION

The flood plain of the study area consists of approximately thirty-five percent urban habitat, fifty-one percent agricultural crops, zero percent old field, seven percent forest, three percent wetland, and four percent lake and pond. The terrestrial vegetation, therefore, consists of the seven percent which is in forest and probably an equal area which consists of fencerows and edges.

The fencerow habitat is highly productive for some species of wildlife, such as small bird species, mourning dove, bobwhite quail, eastern cottontail, woodchuck, foxes, opossum, and striped skunk. The fencerows usually contain vigorous growths of "opportunistic" vegetation characteristic of early stages of succession. Herbaceous plants, such as daisy fleabane, ragweeds, goldenrod, and grasses, occupy fencerows along with

early successional woody species, such as poison ivy, wild grape, climbing bittersweet, smooth sumac, box elder, elm, mulberry, osage orange, and others. If the soil is particularly wet, then the woods species will include numerous black willow, cottonwood, and silver maple to the exclusion of many of the other species. Fencerows are generally diverse in terms of species encountered and therefore provide a diversity of food and cover types at different times of the season. However, this habitat gets periodically destroyed when the farmer cleans up his fencerows at irregular intervals and then begins to develop again. It is therefore cyclic in its development, at irregular intervals. Consequently, large trees producing mast and den sites are generally not present in fence rows although the vigor of the vegetation is excellent, due to the partial lack of competition, the penetration of sunlight from both sides, and the benefits of artificial fertilizers applied nearby for agricultural crops, such as soybeans or corn. The cottonwood, black willow, silver maple (wet soil) type of fence row is probably not as productive to wildlife as is the diverse fencerow community of drier sites.

The seven percent of the area which is in forest is widely scattered. Since most of the land was used for development, very little was left as forest. The latter probably represented land which was too difficult to cultivate, forest which was purposely left (and used) as farm woodlot, and land which remained forest by some accident of location or ownership.

Of the ten woods studied, which were selected for study on the basis of their acreage and their location, six species were dominants or co-dominants one or more times (based on at least twenty percent dominance).

Silver maple was dominant in five woods, pin oak in four, green ash in three, American elm and bur oak in two, and black willow in a single one (as shown in Tables IX-1 through IX-10). The composition of the vegetation indicated that these woods were typical floodplain woods with a better diversity of species than was found in the St. Clair County portion of the American Bottoms (Kulfinski, 1973) where cottonwood and black willow were more often the dominants.

The vigor of the woods vegetation was excellent. Most of the woods had few trees over eighteen inches dbh. Woods 2, 8, and 5 had sixteen, eleven, and nine trees over eighteen inches dbh per 20,000 square feet of sampled area. Woods 2, therefore, averaged one eighteen inch dbh tree per each thirty foot by thirty foot area. Overall, the ten woods averaged approximately 200 trees per 20,000 square foot area, which is an average of one in each ten foot by ten foot area. The obvious conclusion is that the woods have all been disturbed or cleared in the past and that they represent very sound successional stands which are considerably removed in time from either maturity or from climax. The lack of maturity produces a scarcity of large, overage trees for tree-using animals, such as fox, squirrel, raccoon, and opossum. The trees are also too small on the average to be as productive of mast as they might be even though mast and other fruit producing species are present or even dominant.

In summer, both fencerow and woods constitute the principal wildlife habitats of the area, with both being vigorous, but both being so immature as to be lacking in den cavities or mast production. The woods

are somewhat articulated in the summertime by the intervening agricultural fields and their crops, but they are discontinuous after crop harvest and are therefore less useful as wildlife habitat than they might otherwise be. Furthermore, such pioneer floodplain species as willow and cottonwood produce tiny seeds which are not edible to larger animals and these species of trees are not generally foodproductive for wildlife.

Agricultural fields are vigorous and useful to wildlife as cover and later as food. However, their usefulness declines after harvest.

Greenbelts are commonly developed along drainageways to create parks or park-like entities to screen waterways and levees, to make them more attractive, to provide an area for picnicing, hiking or bicycling, and to create some degree of the original forest habitat for aesthetic as well as for wildlife purposes. Such belts of vegetation can be developed by: (1) allowing nature to take its course through the various successional stages, the woods being enjoyed for each assemblage of species in turn; or (2) planting species which are characteristic of some "ideal" stage of succession (perhaps maturity) and managing this stage in such a way as to prolong or even to perpetuate it; and (3) planting artificial or domesticated vegetation of aesthetic choice. In any event, the vigor of existing terrestrial woods vegetation is excellent and it would serve well either for wildlife or to be included in the development of multi-aged and multi-character greenbelts. Very little of the vegetation is made up of mature or over-mature trees and it could be used well for greenbelt creation if its location and composi-

tion were suitable. A diversity of woods types would likely be more desirable than a monotonous planting from the standpoint of aesthetics, wildlife diversity, and academic interest.

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SECTION X

BIOLOGICAL ELEMENTS
ANIMALS, GENERAL

PREPARED BY

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Tables X-1 to X-4 contain lists of terrestrial vertebrates (amphibians, reptiles, birds, and mammals) which can be expected to be found in the project area. The tables include information on a) type(s) of habitat within the area in which each species can be expected, b) abundance of each species within the area, c) some quantitative evidence on which abundance estimates were partially based, and d) for birds, the period of the year during which the birds can be found.

Abundance of each species is indicated by the following symbols:

A = Abundant -- frequently seen by the casual observer (in appropriate habitats and seasons)

C = Common -- easily observed by the interested observer

U = Uncommon -- infrequently seen by the interested observer, perhaps no more than once per year

R = Rare -- not observed within the area every year

The column labeled "evidence" provides some quantitative information used in estimating abundance. The project area includes much of the campus of Southern Illinois University at Edwardsville, consequently a substantial amount of collecting by students and faculty has occurred in the area and specimens are on file in the SIUE collection of herpetological and mammalian specimens. The numbers in the "evidence" column in the tables for amphibians, reptiles and mammals indicate the number of specimens in SIUE collections which came from the project area. In addition, in these three tables, the following letters have the indicated meanings:

A = SIUE collections contain specimens from the American Bottoms outside of the project area but none within the project area.

M = SIUE collections contain specimens from Madison County outside of the project area but no specimens within the project area or other parts of the American Bottoms.

C = SIUE collections contain specimens from counties adjacent to Madison County but no specimens from Madison County.

R = Reliable observers, frequently the author, have seen specimens within the project area but no specimens exist within SIUE collections or from nearby areas.

L = The evidence for the occurrence of the species within the area is entirely based on literature information of geographical distribution and habitat utilization.

The number of specimens in the collection cannot be used directly to indicate abundance as it is highly influenced by the ease of collecting and preserving the species as well as the abundance of the species.

The quantitative evidence for occurrence of birds is derived from four years of observations reported by the Audubon Society. Christmas Bird Counts are done in late December on one day. Data cover the years 1974 through 1977 for the count reported at "Collinsville, Illinois". It is done within a seven mile circle centered on the intersection of Interstate highway 70 and Illinois state highway 159 at approximately 38° 43' N latitude and 89° 58' W longitude, as shown in Figure X-1*. Thus approximately sixty percent of the Christmas Bird Count area is within the project area and it includes about fifty percent of the American Bottoms portion and all of the upland portion. The portion outside of the project area is primarily uplands.

The Spring Bird Counts include various areas within Madison County. Data cover the years 1975 through 1978. During these four years, one individual has been assigned an area approximating the American Bottoms floodplain portion of the project study area. These observations have been tabulated separately. In all three columns, two numbers separated by

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*all figures referred to are located in Volume 6 of 6 of this Environmental Inventory Report.

Table X-1 Amphibians of the Cahokia Canal Drainage Area

Common Name	Scientific Name	Abundance*	City	Suburban	Exurban	Agricultural	Old Field	Priaries	Upland Forest	Flood Plain Forest	Lakes & Ponds	Rivers & Streams	Mudflats & Sandbars	Wetlands & Marshes	Evidence*
	Order Caudata														
Spotted Salamander	Ambystoma maculatum	R								X				X	L
Small-mouthed Salamander	Ambystoma texanum	C			X		X		X	X	X	X		X	41
Eastern Tiger Salamander	Ambystoma tigrinum	R		X	X	X	X		X	X	X			X	L
Central Newt	Notophthalmus viridescens	R					X			X	X			X	L
Slimy Salamander	Plethodon glutinosus	R								X				X	L
Mud Puppy	Necturus maculosus	U									X	X			L
Western Lesser Siren	Siren intermedia nettingi	U									X	X		X	L
	Order Salientia														
American Toad	Bufo americanus	A		X	X	X	X		X	X	X			X	35
Fowler's Toad	Bufo woodhousei fowleri	A			X	X	X		X	X	X			X	38
Cricket Frog	Acris crepitans blanchardi	A									X	X		X	68
Western Chorus Frog	Pseudacris triseriata	A		X	X	X	X				X			X	41
Illinois Chorus Frog	Pseudacris streckeri	R			X						X			X	6
Northern Spring Peeper	Hyla crucifer crucifer	C			X		X		X	X	X			X	18
Gray Treefrog	Hyla versicolor	U							X	X	X	X		X	10
Crayfish Frog	Rana areolata	R			X	X	X								L
Bullfrog	Rana catesbeiana	C									X	X			30
Green Frog	Rana clamitans melanota	R										X			4
Pickerel Frog	Rana palustris	U									X	X		X	6
Northern Leopard Frog	Rana pipiens pipiens	C					X				X	X		X	
Southern Leopard Frog	Rana pipiens sphenocephala	C					X				X	X		X	10

*See text for symbols

Table X-2 Reptiles of the Cahokia Canal Drainage Area

Common Name	Scientific Name	Abundance	City	Suburban	Exurban	Agricultural	Old Field	Prairies	Upland Forest	Flood Plain Forest	Lakes & Ponds	Rivers & Streams	Mudflats & Sandbars	Wetlands & Marshes	Evidence*
	Order Testudines														
Snapping Turtle	Chelydra serpentina	C									X	X			R
Alligator Snapping Turtle	Macroclemys temmincki	R										X			L
Stinkpot	Sternothaerus odoratus	C									X	X			L
Eastern Box Turtle	Terrapene carolina	C							X	X					R
Ornate Box Turtle	Terrapene ornata	R					X		X						L
Painted Turtle	Chrysemys picta	C									X	X			R
Red-eared Turtle	Pseudemys scripta elegans	C									X	X			R
Slider	Pseudemys concinna x floridana	R									X	X			L
False Map Turtle	Graptemys pseudogeographica	U									X				L
Map Turtle	Graptemys geographica	C									X	X			L
Smooth Softshell	Trionyx muticus	U										X			1
Spiny Softshell	Trionyx spinifer	C									X	X			R
	Order Squamata														
	Suborder Saria														
Fence Lizard	Sceloporus undulatus	C			X		X		X	X					32
Slender Glass Lizard	Ophisaurus attenuatus	R					X								L
Six-lined Racerunner	Chemidophorus sexlineatus	U			X		X	X							2
Ground Skink	Scincella laterale	R							X						1
Five-lined Skink	Eumeces fasciatus	C			X		X		X	X					5

* See text for symbols

Table X-2 cont. Reptiles of the Cahokia Canal Drainage Area

Common Name	Scientific Name	A	C	S	E	A	O	P	U	F	L	R	M	W	E
Broad-Headed Skink	Eumeces laticeps	C					X		X	X					7
	Order Squamata														
	Suborder Serpentes														
Worm Snake	Carphophis amoenus	C			X		X		X	X					12
Ringneck Snake	Diadophis punctatus	U			X			X	X						2
Eastern Hognose Snake	Heterodon platyrhinos	U		X	X		X		X	X					3
Rough Green Snake	Opheodrys aestivus	U					X		X	X		X			3
Eastern Yellow-bellied Snake	Coluber constrictor	C			X		X		X	X					21
Great Plains Rat Snake	Elaphe guttata	R			X		X		X	X					L
Black Rat Snake	*Elaphe obsoleta*	C			X		X		X	X					17
Prairie Kingsnake	Lampropeltis calligaster	C			X		X								15
Speckled Kingsnake	Lampropeltis getulus	R					X		X						1
Milk Snake	Lampropeltis triangulum	R			X		X		X	X					3
Ribbon Snake	Thamnophis sauritus	C		X	X	X	X				X	X		X	33
Garter Snake	Thamnophis sirtalis	R					X								L
Lined Snake	Tropidoclonion lineatum	R		X	X										10
Western Earth Snake	Virginia valeriae	R					X		X						L
Midland Brown Snake	Storeria dekayi	U			X	X	X		X	X					L
Red-bellied Snake	Storeria occipitomaculata	R					X		X	X					L
Yellow-bellied Water Snake	Natrix erythrogaster	U									X	X		X	1
Graham's Water Snake	Natrix grahami	U									X			X	7
Diamond Backed Water Snake	*Natrix rhombifera*	U									X			X	3
Northern Water Snake	Natrix sipedon	A									X	X			28
Copperhead	Agkistrodon contortrix	U			X		X		X						L
Massasauga	Sistrurus catenatus	U					X							X	1
Timber Rattler	Crotalis horridus horridus	R							X						L

Table X-3 Birds of Cahokia Canal Drainage Area

Common Name	Scientific Name	Resident Period*	Abundance*	City	Suburban	Exurban	Ag	Old Field	Prairies	Upland Forest	Flood Plain Forest	Lakes & Ponds	Rivers & Streams	Mudflats & Sandbars	Wetlands & Marshes	Christmas Bird Count (birds/years)*	Spring Bird Counts, Madison County*	Spring Bird Counts, Flood Plain of Study Area*
	Order Gaviiformes																	
Common Loon	Gavia immer	M	R									X	X					
	Order Podicipediformes																	
Horned Grebe	Colymbus auritus	M	R									X	X					
Eared Grebe	Colymbus caspicus	M	R									X	X					
Pied-billed Grebe	Podilymbus podiceps	M	U									X	X			2/1	1/1	1/1
	Order Pelecaniformes																	
Double-crested Cormorant	Phalacrocorax auritus	M	R									X	X				1/1	
	Order Ciconiiformes																	
Great Blue Heron	Ardea herodias	S	U									X	X	X	X	4/1	1/1	
Green Heron	Butorides virescens	S	C									X	X	X	X		9/4	1/1
Little Blue Heron	Florida caerulea	S	C									X	X	X	X		19/4	12/4
Cattle Egret	Bubulcus ibis	S	C									X	X	X	X		5/2	4/1
Great Egret	Casmerodius albus	S	C									X	X	X	X		8/3	7/3
Snowy Egret	Leucophoyx thula	S	R									X	X	X	X		1/1	

*See text for symbols

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Black-crowned Night Heron	Nycticorax nycticorax	S	C									X	X	X	X		16/3	15/2
Yellow-crowned Night Heron	Nyctanassa violacea	S	U									X	X	X	X			
Least Bittern	Ixobrychus exilis	S	R												X			
American Bittern	Botaurus lentiginosus	M	U									X	X	X	X		1/1	
	Order Anserformes																	
Whistling Swan	Olor columbianus	M	R									X	X					
Canada Goose	Branta canadensis	W	U				X					X	X	X	X	32/2	1/1	
Black Brant	Branta bernicla	M	R									X	X	X	X			
White-fronted Goose	Anser albifrons	M	R									X	X	X	X			
Snow Goose	Chen caerulescens	W	R									X	X	X	X			
Mallard	Anas platyrhynchos	(P)W	A									X	X		X	290/4	93/4	30/4
Black Duck	Anas rubripes	W	R									X	X		X			
Gadwall	Anas strepera	M	U									X	X		X			
Pintail	Anas acuta	M	U									X	X		X		1/1	
Green-winged Teal	Anas crecca	M	C									X	X	X	X			
Blue-winged Teal	Anas discors	M	U									X	X	X	X		5/3	4/3
American Widgeon	Anas americana	M	U									X	X		X			
Northern Shoveler	Anas clypeata	M	U									X	X	X	X			
Wood Duck	Aix sponsa	S	C							X	X		X		X		18/4	
Redhead	Aythya americana	M	C									X	X	X				
Ring-necked Duck	Aythya collaris	M	C									X	X	X				
Canvasback	Aythya valisneria	W	U									X	X					
Greater Scaup	Aythya marila	W	R									X	X					
Lesser Scaup	Aythya affinis	M	C									X	X			1/1	1/1	
Common Goldeneye	Bucephala clangula	W	U									X	X			33/2		
Bufflehead	Bucephala albeola	M	U									X	X			13/2		
Oldsquaw	Clangula hyemalis	M	R									X	X					
White-winged Scoter	Melanitta deglandi	M	R									X	X					
Surf Scoter	Melanitta perspicillata	M	R									X	X					

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
American Scoter	Oidemia nigra	M	R									X	X					
Ruddy Duck	Oxyura jamaicensis	M	C									X	X				3/1	
Hooded Merganser	Lophodytes cucullatus	M	R									X	X					
Common Merganser	Mergus merganser	W	U									X	X			12/2		
Red-breasted Merganser	Mergus serrator	M	R									X	X					
	Order Falconiformes																	
Turkey Vulture	Cathartes aura	S	U				X	X		X	X						2/1	
Black Vulture	Coragyps atratus	S	R				X	X			X							
Mississippi Kite	Ictinia misisippiensis	S	R				X	X			X							
Sharp-shinned Hawk	Accipiter striatus	M	U				X	X		X	X					1/1	1/1	
Cooper's Hawk	Accipiter cooperii	S	U					X		X						5/2		
Red-tailed Hawk	Buteo jamaicensis	P	C			X	X	X	X	X	X					37/4	12/3	2/1
Red-shouldered Hawk	Buteo lineatus	P	R								X				X	2/1		
Broad-winged Hawk	Buteo platypterus	S	R							X								
Rough-legged Hawk	Buteo lagopus	W	R				X	X								1/1		
Bald Eagle	Haliaeetus leucocephalus	W	U				X	X			X	X	X	X	X			
Marsh Hawk	Cirus cyaneus	W	U					X			X				X	8/4		
Osprey	Pandion haliaetus	M	R								X	X	X					
Peregrine Falcon	Falco peregrinus	M	R	X								X	X					
Merlin	Falco columbarius	M	R					X		X	X							
American Kestrel	Falco sparverius	P	C			X	X	X	X	X	X					64/3	7/4	1/1
	Order Galliformes																	
Bobwhite	Colinus virginianus	P	A			X	X	X		X						65/4	113/4	21/4
	Order Gruiformes																	
King Rail	Rallus elegans	S	U												X		1/1	
Virginia Rail	Rallus limicola	M	R									X			X		1/1	
Sora	Porzana carolina	M	U												X		1/1	
Yellow Rail	Coturnicops noveboracensis	M	R												X			
Common Gallinule	Gallinula chloropus	S	U									X			X		1/1	

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
American Coot	Fulica americana	S	C									X	X		X		35/3	28/3
	Order Charadriiformes																	
Semipalmated Plover	Charadrius hiaticula	M	U									X		X	X			
Killdeer	Charadrius vociferus	S	C			X	X	X				X		X	X	4/2	25/4	7/3
American Golden Plover	Pluvialus dominica	M	U			X	X	X										
Black-bellied Plover	Squatarola squatarola	M	R									X		X	X			
Ruddy Turnstone	Arenaria interpres	M	R					X				X		X	X			
American Woodcock	Philohela minor	S	U					X			X				X		3/1	
Common Snipe	Capella gallinago	M	U									X	X	X	X	2/1	1/1	
Upland Sandpiper	Bartramia longicauda	S	U				X	X										
Spotted Sandpiper	Actitis macularia	S	C									X	X	X	X		25/4	15/4
Solitary Sandpiper	Tringa solitaria	M	C									X	X	X	X		7/3	4/4
Willet	Catoptrophorus semipalmatus	M	R									X	X	X				
Greater Yellowlegs	Totanus melanoleucus	M	U									X	X	X			1/1	
Lesser Yellowlegs	Totanus flavipes	M	C									X	X	X			8/2	7/2
Pectoral Sandpiper	Erolia melanotos	M	U									X	X	X			1/1	
Least Sandpiper	Erolia minutilla	M	C									X	X	X			5/2	
White-rumped Sandpiper	Erolia fuscicollis	M	R									X	X	X			1/1	
Baird's Sandpiper	Erolia bairdii	M	R									X	X	X				
Dunlin	Erolia alpina	M	R									X	X	X				
Short-billed Dowitcher	Limnodromus scolopaceus	M	R									X	X	X			1/1	
Long-billed Dowitcher	Limnodromus griseus	M	U									X	X	X			1/1	
Stilt Sandpiper	Micropalama himantopus	M	U									X	X	X				
Semipalmated Sandpiper	Ereunetes pusillus	M	C									X	X	X			1/1	
Western Sandpiper	Ereunetes mauri	M	R									X	X	X			1/1	
Buff-breasted Sandpiper	Tryngites subruficollis	M	R				X	X										

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Hudsonian Godwit	Limosa haemastica	M	R									X	X	X				
Sanderling	Crocethia alba	M	R									X	X	X				
American Avocet	Recurvirostra americana	M	R									X	X	X				
Wilson's Phalarope	Steganopus tricolor	M	R									X	X					
Northern Phalarope	Lobipes lobatus	M	R									X	X					
Glaucous Gull	Larus hyperboreus	W	R									X	X					
Herring Gull	Larus argentatus	W	C					X				X	X			212/2		
Ring-billed Gull	Larus delawarensis	W	A					X				X	X			524/3		
Bonaparte's Gull	Larus philadelphia	M	U									X	X					
Franklin's Gull	Larus pipixcan	M	R									X	X					
Forster's Tern	Sterna fosteri	M	U									X	X					
Common Tern	Sterna hirundo	M	U					X				X	X					
Least Tern	Sterna albifrons	M	R									X	X		X			
Caspian Tern	Hydroprogne caspia	M	U									X	X					
Black Tern	Chlidonias niger	M	C									X	X		X		1/1	
Order Columbiformes																		
Rock Dove	Columba livia	P	A	X	X	X	X	X								333/3	105/4	27/4
Mourning Dove	Zenaidura macroura	P	A		X	X	X	X		X	X				X	341/4	252/4	27/4
Order Cuculiformes																		
Yellow-billed Cuckoo	Coccyzus americanus	S	C			X		X		X	X						24/4	5/3
Black-billed Cuckoo	Coccyzus erythropthalmus	S	R			X		X		X	X						1/1	
Order Strigiformes																		
Barn Owl	Tyto alba	P	R					X										
Screech Owl	Otus asio	P	C		X	X		X		X	X							
Great Horned Owl	Bubo virginianus	P	U							X	X						1/1	
Barred Owl	Strix varia	P	C								X				X		2/2	1/1
Long-eared Owl	Asio otus	P	R							X	X							

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Short-eared Owl	Asio flammeus	W	R					X										
	Order Caprimulgiformes																	
Chuck-will's-widow	Caprimulgus carolinensis	S	C							X	X						1/1	
Whip-poor-will	Caprimulgus vociferous	S	C							X	X						1/1	1/1
Common Nighthawk	Chordeiles minor	S	C	X	X	X		X									30/3	1/1
	Order Apodiformes																	
Chimney Swift	Chaetura pelagica	S	A	X	X	X	X	X									587/4	301/4
Ruby-throated Hummingbird	Archilochus colubris	S	C			X		X		X	X						7/3	3/2
	Order Coraciiformes																	
Belted Kingfisher	Megaceryle alcyon	S	C									X	X			9/4	3/3	1/1
	Order Piciformes																	
Common Flicker	Colaptes auratus	P	A					X		X	X					166/4	84/4	20/4
Pileated Woodpecker	Dryocopus pileatus	P	R							X	X					7/2	8/3	1/1
Red-bellied Woodpecker	Centurus carolinus	P	A					X		X	X					96/4	78/4	9/4
Red-headed Woodpecker	Melanerpes erythro-cephalus	P	A		X	X		X		X	X					84/4	77/4	10/4
Yellow-bellied Sapsucker	Sphyrapicus varius	M	U													7/3		
Hairy Woodpecker	Dendrocopos villosus	P	C		X	X		X		X	X					31/4	4/3	
Downy Woodpecker	Dendrocopos pubescens	P	A		X	X	X	X		X	X					79/4	36/4	7/4
	Order Passeriformes																	
Eastern Kingbird	Tyrannus tyrannus	S	C					X									28/4	4/2
Great Crested Flycatcher	Myiarchus crinitus	S	C					X		X	X						85/4	
Eastern Phoebe	Sayornis phoebe	S	U					X		X	X						8/3	
Yellow-bellied Flycatcher	Empidonax flaviventris	M	R							X	X							
Acadian Flycatcher	Empidonax virescens	S	C							X	X				X		2/1	

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Traill's Flycatcher	Empidonax traillii	S	U								X				X			
Least Flycatcher	Empidonax minimus	M	U					X		X	X						5/3	2/4
Eastern Wood Pewee	Contopus virens	S	C					X		X	X						20/3	4/2
Olive-sided Flycatcher	Nuttallornis borealis	M	R					X										
Horned Lark	Eremophila alpestris	P	A			X	X	X								317/3	28/4	8/3
Tree Swallow	Iridoprocne bicolor	M	C			X		X			X				X		97/3	84/2
Bank Swallow	Riparia riparia	S	U			x		x				X	X				12/1	8/1
Rough-winged Swallow	Stelgidopteryx ruficollis	S	C									X	X				34/4	14/1
Barn Swallow	Hirundo rustica	S	A		X	X		X									199/4	44/3
Cliff Swallow	Petrochelidon pyrrhonota	S	U			X		X									2/1	
Purple Martin	Progne subis	S	C		X	X		X									75/4	14/4
Blue Jay	Cyanocitta cristata	P	A		X	X		X		X	X					509/4	280/4	52/4
Common Crow	Corvus brachyrhynchos	P	A			X	X	X		X	X					283/4	122/4	12/4
Fish Crow	Corvus ossifragus	P	R								X	X	X					
Black-capped Chickadee	Parus atricapillus	P	A		X	X		X		X	X					125/2	39/4	11/3
Carolina Chickadee	Parus carolinensis	P	A		X	X		X		X	X					141/3	20/2	8/2
Tufted Titmouse	Parus bicolor	P	A			X		X		X	X					170/4	125/4	13/4
White-breasted Nuthatch	Sitta carolinensis	P	C			X				X	X					18/4	10/3	2/1
Red-breasted Nuthatch	Sitta canadensis	W	R			X				X	X					6/3	1/1	1/1
Brown Creeper	Certhia familiaris	M	U			X				X	X					13/4		
House Wren	Troglodytes aedon	S	C	X	X	X		X		X	X						90/4	24/4
Winter Wren	Troglodytes troglodytes	W	R			X		X		X	X					1/1		
Bewick's Wren	Thryomanes bewickii	S	R							X	X							
Carolina Wren	Thryothorus ludovicianus	P	U					X		X	X					61/4	43/4	7/2
Long-billed Marsh Wren	Telmatedytes palustris	S	U												X	1/1		
Short-billed Marsh Wren	Cistothorus platensis	S	U												X			
Mockingbird	Mimus polyglottos	P	A		X	X	X	X		X	X					127/4	102/4	34/4

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Gray Catbird	Dumetella carolinensis	S	A			X		X		X	X						79/4	16/4
Brown Thrasher	Toxostoma rufum	S	A			X		X		X	X					5/3	103/4	21/4
American Robin	Turdus migratorius	P	A		X	X	X	X								115/4	584/4	148/4
Wood Thrush	Hulocichla mustelina	S	C							X	X						40/4	6/3
Swainson's Thrush	Hulocichla ustulata	M	U							X	X						55/4	4/2
Hermit Thrush	Hulocichla guttata	M	U							X	X						3/3	1/1
Gray-cheecked Thrush	Hylocichla minima	M	C							X	X						20/4	6/2
Veery	Hylocichla fuscescens	M	R							X	X				X		4/2	
Eastern Bluebird	Sialia sialis	P	C			X		X								1/1	8/3	
Blue-gray Gnatcatcher	Polioptila caerulea	S	C							X	X						9/3	1/1
Golden-crowned Kinglet	Regulus satrapa	M	C							X	X					12/3		
Ruby-crowned Kinglet	Regulus calendula	M	C							X	X					4/3	18/2	2/1
Water Pipit	Anthus spinoletta	M	R				X	X						X	X			
Cedar Waxwing	Bombycilla cedrorum	W	C			X				X	X					109/3	2/1	
Loggerhead Shrike	Lanius ludovicianus	P	U			X		X									1/1	
Starling	Sturnus vulgaris	P	A	X	X	X	X	X		X	X				X	311000/4	876/4	313/4
White-eyed Vireo	Vireo griseus	S	C			X		X									27/4	1/1
Bell's Vireo	Vireo bellii	S	U					X		X	X		X				3/2	
Yellow-throated Vireo	Vireo flavifrons	S	U			X				X	X							
Solitary Vireo	Vireo solitarius	M	R							X	X						1/1	
Red-eyed Vireo	Vireo olivaceus	S	C							X	X						46/4	5/3
Philadelphia Vireo	Vireo philadelphicus	M	R					X		X	X							
Warbling Vireo	Vireo gilvus	S	C			X				X	X		X				56/4	15/4
Black-&-White Warbler	Mniotilta varia	S	U							X	X						4/3	
Prothonotary Warbler	Protonotaria citrea	S	U							X	X		X		X		1/1	
Worm-eating Warbler	Helmitheros vermivorus	S	U							X							1/1	
Golden-winged Warbler	Vermivora chrysoptera	M	U					X									3/2	

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Blue-winged Warbler	Vermivora pinus						X								X		1/1	1/1
Tennessee Warbler	Vermivora peregrina	M	C							X	X				X		102/4	15/4
Orange-crowned Warbler	Vermivora celata	M	R					X		X	X							
Nashville Warbler	Vermivora ruficapilla	M	U					X		X	X				X		21/4	5/2
Northern Parula	Parula americana	S	C							X	X		X		X		2/1	
Yellow Warbler	Dendroica petechia	S	C			X		X			X				X		9/3	1/1
Magnolia Warbler	Dendroica magnolia	M	U							X	X						9/2	2/1
Cape May Warbler	Dendroica tigrina	M	R							X	X							
Yellow-rumped Warbler	Dendroica coronata	M	A							X	X					8/3	118/4	42/4
Black-throated Green Warbler	Dendroica virens	M	U							X	X						5/3	
Cerulean Warbler	Dendroica cerulea	S	U							X	X		X		X		1/1	
Blackburnian Warbler	Dendroica fusca	M	U							X	X						2/2	
Yellow-throated Warbler	Dendroica dominica	S	U								X		X		X		13/3	
Chestnut-sided Warbler	Dendroica pensylvanica	M	U					X		X	X						5/2	
Bay-breasted Warbler	Dendroica castanea	M	U							X	X							
Blackpoll Warbler	Dendroica striata	M	C							X	X						7/3	2/1
Pine Warbler	Dendroica pinus	M	R					X		X	X						4/1	1/1
Prairie Warbler	Dendroica discolor	S	U							X								
Palm Warbler	Dendroica palmarum	M	C							X	X				X		32/4	3/1
Ovenbird	Seiurus aurocapillus	S	U							X	X						5/3	
Northern Waterthrush	Seiurus noveborancensis	M	U										X		X		5/3	
Louisiana Waterthrush	Seiurus motacilla	S	U										X		X		2/2	
Kentucky Warbler	Oporornis formosus	S	C							X	X						22/4	15/3
Connecticut Warbler	Oporornis agilis	M	R							X	X							
Mourning Warbler	Oporornis philadelphia	M	R							X	X				X			
Common Yellowthroat	Geothlypis trichas	S	C			X		X					X		X		65/4	10/3
Yellow-breasted Chat	Icteria virens	S	C					X									24/3	2/1

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Hooded Warbler	Wilsonia citrina	M	R							X	X							
Wilson's Warbler	Wilsonia pusilla	M	U					X							X		1/1	
Canada Warbler	Wilsonia canadensis	M	U							X	X		X					
American Redstart	Setophaga ruticilla	S	C							X	X	X	X		X		3/2	
House Sparrow	Passer domesticus	P	A		X	X	X	X								3109/4	701/4	206/4
European Tree Sparrow	Passer montanus	P	C			X	X	X								300/4	24/3	20/3
Bobolink	Dolichonyx oryzivorus	M	C					X									215/3	
Eastern Meadowlark	Sturnella magna	P	A				X	X	X							81/4	148/4	19/4
Western Meadowlark	Sturnella neglecta	M	R				X	X	X									
Yellow-headed Blackbird	Xanthocephalus xanthocephalus	M	R					X										
Redwinged Blackbird	Agelaius phaeniceus	P	A	X	X	X	X	X		X	X				X	709000/4	1336/4	745/4
Orchard Oriole	Icterus spurius	S	U			X		X		X	X						10/4	2/1
Northern Oriole	Icterus galbula	S	C			X		X		X	X						102/3	27/4
Rusty Blackbird	Euphagus carolinus	M	C					X			X				X	1/1		
Brewer's Blackbird	Euphagus cyanocephalus	M	R					X										
Common Grackle	Quiscalus quiscula	P	A	X	X	X	X	X		X	X				X	563000/4	1234/4	425/4
Brown-headed Cowbird	Molothrus ater	S	A	X	X	X	X	X		X	X				X	517/4	121/4	18/4
Scarlet Tanager	Piranga olivacea	S	U			X				X	X						13/4	5/3
Summer Tanager	Piranga rubra	S	U			X				X	X						4/3	
Cardinal	Richmondena cardinalis	P	A		X	X		X		X	X					534/4	428/4	60/4
Rose-breasted Grosbeak	Pheucticus ludovicianus	S	U							X	X						36/4	5/3
Blue Grosbeak	Guiraca caerulea	S	R					X									1/1	
Indigo Bunting	Passerina cyanea	S	A			X		X									188/4	46/4
Dickcissel	Spiza americana	S	C			X	X	X									92/3	5/1
Evening Grosbeak	Hesperiphona vespertina	W	R		X	X		X		X	X							
Purple Finch	Carpodacus purpureus	W	U		X	X		X		X	X					12/3		

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Common Redpoll	Acanthus flammea	W	R			X												
Pine Siskin	Spinus pinus	W	R		X	X		X								2/2		
American Goldfinch	Spinus tristis	P	A			X		X		X	X				X	191/4	153/4	24/4
Red Crossbill	Loxia curvirostra	W	R			X												
White-winged Crossbill	Loxia leucoptera	W	U			X										4/1		
Rufous-sided Towhee	Pipilo erythrophthalmus	S	C			X		X										
Savannah Sparrow	Passerculus sandwichensis	M	U				X	X	X								2/1	
Grasshopper Sparrow	*Ammodramus savannarum*	S	U				X	X									25/3	
Henslow's Sparrow	Passerherbulus henslowii	M	R					X										
LeConte's Sparrow	Passerherbulus caudacutus	W	R												X			
Sharp-tailed Sparrow	Ammospiza caudacuta	M	R												X			
Vesper Sparrow	Poaecetes gramineus	M	U			X	X	X									2/1	
Lark Sparrow	Chondestes grammacus	S	U			X		X									3/2	
Dark-eyed Junco	Junco hyemalis	W	A		X	X				X	X					1187/4		
Oregon Junco	Junco oreganus	W	R		X	X				X	X							
Tree Sparrow	Spizella arborea	W	A		X	X	X								X	217/4		
Chipping Sparrow	Spizella passerina	S	C		X	X		X									44/4	12/4
Clay-colored Sparrow	Spizella pallida	M	R			X		X										
Field Sparrow	Spizella pusilla	S	A			X		X								52/4	115/4	14/4
Harris' Sparrow	Zonotrichia querula	W	R			X		X		X	X							
White-crowned Sparrow	Zonotrichia leucophrys	W	A			X		X								66/4	149/4	8/3
White-throated Sparrow	Zonotrichia albicollis	W	C							X	X					69/4	92/4	5/3
Fox Sparrow	Passerella iliaca	W	U							X	X							
Lincoln's Sparrow	Melospiza lincolnii	M	U							X	X				X	4/1	3/2	
Swamp Sparrow	Melospiza georgiana	W	U							X	X				X	18/4	8/3	4/2
Song Sparrow	Melospiza melodia	P	A		X	X	X	X								161/4	151/4	45/4
Lapland Longspur	Calcarius lapponicus	W	U			X	X	X										

Table X-3 continued Birds of the Cahokia Canal Drainage Area

Common Name	Scientific Name	RP	A	C	S	E	A	O	P	U	F	L	R	M	W	CBC	SBC, MC	SBC, FP
Smith's Longspur	Calcarius pictus	M	R			X	X	X										

Table X-4 Mammals of the Cahokia Canal Drainage Area

Common Name	Scientific Name	Abundance*	City	Suburban	Exurban	Agricultural	Old Field	Priaries	Upland Forest	Flood Plain Forest	Lakes & Ponds	Rivers & Streams	Mudflats & Sandbars	Wetlands & Marshes	Evidence*
	Order Marsupialia														
Opossum	Didelphis marsupialis	A		X	X		X		X	X					5
Least Shrew															
	Order Insectivora														
Least Shrew	Cryptotis parva	C					X								2
Short-tailed Shrew	Blarina brevicauda	A			X		X		X	X					6
Eastern Mole	Scalopus aquaticus	A		X	X		X	X							2
	Order Chiroptera														
Little Brown Myotis	Myotis lucifugus	A		X	X	X	X		X	X				X	1
Gray Myotis	Myotis grisescens	R													M
Keen's Myotis	Myotis keenii	U		X	X				X	X					1
Indiana Myotis	Myotis sodalis	R							X	X					L
Silver-haired Bat	Lasionycteris noctivagans	U							X	X					L
Eastern Pipistrel	Pipistrellus subflavus	C		X	X				X	X					M
Big Brown Bat	Eptesicus fuscus	C		X	X				X	X					M
Red Bat	Lasiurus borealis	C		X	X		X		X	X					1
Hoary Bat	Lasiurus cinereus	U							X	X					1
Evening Bat	Nycticeius humeralis	C	X	X	X				X	X					C
	Order Lagomorpha														
Cottontail	Sylvilagus floridanus	A		X	X	X	X	X							5

*See text for symbols

Table X-4 continued

Mammals of the Cahokia Canal Drainage Area

Common Name	Scientific Name	A	C	S	E	A	O	P	U	F	L	R	M	W	E
	Order Rodentia														
Woodchuck	Marmota monax	C				X	X		X	X					A
Eastern Chipmunk	Tamias striatus	A							X						17
Gray Squirrel	Sciurus carolinensis	C							X	X					6
Fox Squirrel	Sciurus niger	A			X				X	X					8
Southern Flying Squirrel	Glaucomys volans	U							X	X					M
Plains Pocket Gopher	Geomys bursarius	U					X								1
Beaver	Castor canadensis	U									X	X			R
Western Harvest Mouse	Reithrodontomys megalotis	R					X								C
Deer Mouse	Peromyscus maniculatus	C		X	X	X	X	X							14
White-footed Mouse	Peromyscus leucopus	A			X		X		X	X					41
Southern Bog Lemming	Synaptomys cooperi	R												X	L
Prairie Vole	Microtus ochrogaster	A		X	X		X	X							26
Pine Vole	Pitymys pinetorum	U							X						1
Muskrat	Ondatra zibethicus	C									X	X		X	1
Norway Rat	Rattus norvegicus	A	X	X	X	X	X								13
House Mouse	Mus musculus	A	X	X	X		X								23
Meadow Jumping Mouse	Zapus hudsonius	R										X			M
	Order Carnivora														
Coyote	Canis latrans	R					X								L
Red Fox	Vulpes fulva	U					X		X	X					A
Gray Fox	Urocyon cinereoargenteus	U							X	X					A
Raccoon	Procyon lotor	C			X				X	X					4
Long-tailed Weasel	Mustela frenata	U					X		X						L
Mink	Mustela vison	U									X	X			M
Striped Skunk	Mephitis mephitis	A			X		X		X	X					C
River Otter	Lutra canadensis	R										X			L

Table X-4 continued Mammals of the Cahokia Canal Drainage Area

Common Name	Scientific Name	A	C	S	E	A	O	P	U	F	L	R	M	W	E
Bobcat	Lynx rufus	R							X	X					L
	Order Artiodectyla														
White-tailed Deer	Odocoileus virginianus	U					X		X	X					R

a slash are given when a species was reported. The first number is the number of individual birds reported as observed during the four census years and the second number is the number of years, of the four, during which the species was reported. Again, abundance cannot be taken directly from these data without considering the seasonal occurrence of the species and the habits of the species as it affects observability.

The information regarding which habitats each species might be expected in are taken from a variety of sources including SIUE collection records, personal observations, observations of others, and literature sources concerning general habitat preferences.

Table X-3 for birds also contains information regarding the season of residence for each species. The symbols used are:

P = Permanent, all year

S = Summer resident

W = Winter resident

M = Migratory or transient

The most common pattern is indicated in those cases where more than one category is applicable.

Since only one turtle is in the SIUE collection, a sample was taken in Horseshoe Lake and released after identification. It consisted of ten Snapping Turtles, two Painted Turtles, twenty-two Redeared Turtles, and three Spring Softshells.

There are no nesting rookeries within the study area. Colonies of bank swallows commonly nest in the bluffs along the western edge of the uplands.

A number of species of vertebrates are quite common in the area.

The most obvious concentration is a mixed flock of birds which roosts between Unites States Highway 40 and Horseshoe Lake during the winter. This flock contains up to four million birds with Starlings, Red-winged Blackbirds, and Common Grackles being the main species present. This flock or portions of it causes some nuisance around residential areas both from droppings and early morning noise. The majority of the flock feeds in agricultural fields to the east, a large number of them well outside of the project area.

Most species of birds which are common in the project area are species which can tolerate fairly close asociation with people either in suburban areas or agricultural fields. A number of them live primarily in forest edge habitats where agricultural activity has not completely cleared the land. Additional clearing of remaining patches of woods would reduce that group.

In addition, a number of aquatic habitat related species are fairly common in the project area. This reflects the presence of wetland and open water in the area. These species will be reduced if water management programs reduce the available habitat for them.

A number of migratory birds also use this habitat as they migrate along the Mississippi River flyway. Many of them are not common but they add significantly to the diversity of birds which can be observed here. Some of these migratory species rarely stop locally anymore because of reduction of wetland habitat and suburban encroachment on the wetlands. Project actions which increase wetlands and adjacent semi-wild areas would reduce this trend and actions which reduce wetlands and adjacent semi-wild areas would increase this trend.

One species, beaver, could be a potential problem to possible projects. Beaver activity has been observed in the north, south, and center of the project area. Construction of beaver dams or holes in banks of canals could interfere with proper functioning of ditches.

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SECTION XI

BIOLOGICAL ELEMENTS
GAME ANIMALS

PREPARED BY

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INTRODUCTION

The habitat of the study area is of a highly disturbed nature, containing both intense agricultural and urban land uses. Aerial photograph analysis of the area showed that approximately forty-five percent is agricultural, thirty-six percent is developed, fifteen percent is forest, old field or shrub areas, and four percent is water areas (not including streams and drainage channels). Interspersion indices, relative indicators of the quantity of edge and therefore the quality of habitat (Baxter & Wolf, 1972) were determined from aerial photographs for each section of the study area. An average index of nine per section with a range of zero to twenty-one was calculated for the entire area.

The southwest part of the study area is the most intensely urbanized portion and yielded interspersion indices of zero to two. The floodplain as a whole had an index of seven and four tenths. With the exceptions of Horseshoe and McDonough Lakes and adjacent wooded lowland, the non-urbanized floodplain is intensely cultivated. Greater variety in land use types is found on the upland to the east; an average index of eleven and six tenths was found here. Extensive development has taken place on the upland, but it is generally less intensive -- suburban, interspersed with wooded hillsides and cropland.

The range of indices in the floodplain was zero to sixteen; in the upland, one to twenty-one. The better quality habitat of the study area includes the two lakes and surrounding woods, the junction of the floodplain and upland and much of the upland itself.

GAME MAMMALS

Mammals hunted in Madison County, the southwest corner of which contains most of the study area, include eastern cottontails, raccoons, fox and gray squirrels, red and gray foxes, woodchucks, and white-tailed deer. Furbearers trapped include foxes, raccoons, muskrats, opossums, mink, beaver, striped skunk, and long-tailed weasel. Harvest data were available for the county only; the size and intense development of the study area in relation to the county as a whole imply that actual numbers for the study area may be lower than one fourth of that of the county.

Cottontail Rabbit

Eastern cottontails were hunted by more resident Illinois hunters than any other small game species from 1956 to 1969; Madison County contained the greatest hunting effort for this species in the state (Preno and Labisky, 1971). During 1970 to 1972, an average of 44,400 rabbits were harvested in this county (Ellis, 1974, in Terpening, et al., 1975).

The cottontail rabbit is common in brushy or weedy fields, thickets, along fencerows and margins of woodlots, forest edges and dry bottomlands. Rabbits will forage in intensely cultivated fields near permanent cover (Hoffmeister and Mohr, 1957). This species is present throughout most of the study area, being abundant in old fields, suburban areas, and agricultural situations where cover, such as a hedgerow or woodlot (both rare in the floodplain), are present. Cottontails are generally absent from highly developed industrial areas, infrequent visitors in residential areas, and generally excluded from intensely cultivated areas because of

the lack of adjacent cover.

Fox and Gray Squirrels

Fox and gray squirrels are the second most intensively hunted species in Illinois with Madison County being the fifth most heavily hunted county in the state (Preno and Labisky, 1971). From 1970 to 1972, an average of 44,700 squirrels were harvested in Madison County (Ellis, 1974, in Terpening, et al., 1975); ninety percent of those taken in the county during 1956 and 1957 were fox squirrels (Preno and Labisky, 1971).

Fox squirrels prefer woods with openings and will utilize woodlots of only a few acres (Hoffmeister and Mohr, 1957). The gray squirrel has more narrow preferences, requiring more mature and extensive stands of timber (Hoffmeister and Mohr, 1957). Both species are found in urban areas containing shade trees, but are rarely found together (Hoffmeister and Mohr, 1957). Although gray squirrels may be abundant in floodplain forests (Goff, 1952), the highly disturbed nature of the study area results in this species being essentially absent from the bottomland; some may occur in the upland woods. The fox squirrel occurs throughout those portions of the study area, rural and urban, that contain den and mast-producing trees.

Woodchuck

Although woodchucks are hunted in Illinois, no harvest data are available. This species prefers rolling, well-drained land, but its habitats range from open country to wooded river bluffs and heavy woods (Hoffmeister and Mohr, 1957). Comparatively high populations occur in river bluffs and bottoms (Brown and Yeager, 1943); and, despite the

disturbed nature of the study area, this species may be found throughout the agricultural areas, especially along vegetated highway and railroad rights-of-way and levees. When soybeans are grown, woodchucks become serious pests.

Red and Gray Foxes

Red and gray foxes are both hunted and trapped in Illinois. In Madison County, from 1967 to 1972, an average of 421 were harvested by hunters and 132 were trapped (Ellis, 1974, in Terpening, et al., 1975). The fur value at 1973 prices (now greatly escalated) for those trapped was estimated at $2,603. No distinction was made between the two species in the harvest data; however, the majority were probably red foxes.

The red fox has wide habitat preferences but is abundant in mixed rolling country of fields, meadows, and semi-open woodlands (Hoffmeister and Mohr, 1957). Gray foxes prefer forests, river bottoms, and bluffs and are most common in heavily wooded areas (Hoffmeister and Mohr, 1957). This species is also less tolerant of man and cultivation than the red fox (Brown and Yeager, 1943). Red foxes probably occur throughout the wooded and agricultural portions of the study area, but are most numerous in the more diverse areas such as near the two lakes, along the floodplain-upland border, and in the upland. The gray fox is probably rare and most likely would occur in the wooded hillsides of the upland.

Raccoon

From 1963 to 1972, an annual average of 5,492 raccoons were harvested, ranking third after rabbits and squirrels in the number taken by hunters in Madison County (Ellis, 1974, Terpening, et al., 1975).

Also, in 1973, 455 raccoons were trapped in Madison County at a 1973 value (now greatly escalated) of $3,350 (Terpening, et al., 1975). Raccoons are usually second or third (after muskrats and sometimes opossums) in the yearly Illinois fur catch (Hoffmeister and Mohr, 1957).

Preferring wooded areas and edges, raccoons are most abundant in wooded river bottoms and less so in wooded uplands; water areas without tree cover are less desirable as habitat (Hoffmeister and Mohr, 1957). Raccoons will thrive in suburban situations if adequate water, food, and den sites are available (Hoffman and Gottschang, 1977). This species is probably common in the wooded, low and medium density suburbs, around the two lakes in the study area, and especially, in the upland, in the wooded hillsides.

Muskrat

The muskrat is the most important furbearer in Illinois (Hoffmeister and Mohr, 1957). During 1973, 5,257 were trapped in Madison County, ten times the number of the second most commonly trapped species, raccoons (Terpening, et al., 1975). The total value of these pelts was estimated at $13,330.

The muskrat is an animal exclusively of the floodplain (Goff, 1952) living along or in rivers, streams, marshes, lakes, and ponds (Hoffmeister and Mohr, 1957). Stable water levels and abundant aquatic and emergent vegetation represent ideal habitat conditions (Brown and Yeager, 1943). Drainage ditches provide suitable habitat although extreme fluctuations in water levels can be detrimental (Hoffmeister and Mohr, 1957). This species is well represented along the shores and in marshes associated

with Horseshoe and McDonough Lakes, and in the drainage channels where suitable conditions occur.

Opossum

The opossum, in numbers, is an important furbearer in Illinois, despite the comparatively low value of its pelt. During 1973 in Madison County, 389 were harvested at a value of $490, ranking third after the muskrat and raccoon in numbers trapped (Terpening, et al., 1975). This species has a wide habitat tolerance; river bluffs and bottoms with forest cover, bluffs and small irregular fields in the valleys and on the slopes constitute ideal habitat (Brown and Yeager, 1943). Opossums, like raccoons, will inhabit suburban areas (Hoffman and Gottschang, 1977); this species probably occurs in the well vegetated suburban areas, the woods adjacent to the two lakes and near or in the wooded uplands of the study area.

Mink

The mink is one of the most highly valued furbearers in Illinois (Hoffmeister and Mohr, 1957). During 1973, 201 were trapped in Madison County at a value of $2,182 (Terpening, et al., 1975). This species is found along or near the shores of lakes or the banks of streams and ditches (Hoffmeister and Mohr, 1957). Minks will use any kind of cover near water including shorelines of streams, lakes, ponds, marshes, small runs and ravines, drifts, windfalls, brush, timberland, and slashings (Brown and Yeager, 1943). Portions of the shoreline of the two lakes and the wooded streams within the upland part of the study area are the only available habitat for this species.

Beavers

Beavers, extirpated in Illinois early this century, were successfully reintroduced in 1935 (Brown and Yeager, 1943). During 1973, seventy-five were trapped in Madison County at a value of $236 (Terpening, et al., 1975). This species needs continuous water, such as a stream or lake, with adequate quantity and quality food trees nearby (Hoffmeister and Mohr, 1957). Some habitat for this species may be provided by Horseshoe and McDonough Lakes. It is probably rare in the study area.

Striped Skunk

Striped skunk, despite low fur values, are trapped in Madison County. During 1973, sixty were harvested at a value of $113 (Terpening, et al., 1975). This species has broad habitat tolerances and can be found at the forest edge, along fencerows, near grassy meadows or in brush areas, but it tends never to be far from water, such as a drainage ditch or stream (Hoffmeister and Mohr, 1957). Largest numbers occur in rolling or bluff country (Brown and Yeager, 1943). This species probably occurs around farmsteads and hedgerows of the floodplain but being somewhat more abundant in the broken woods of the upland.

Long-tailed Weasel

Long-tailed weasels were trapped in Madison County during 1973, but only nineteen were harvested at a value of nineteen dollars (Terpening, et al., 1975). This species occurs in brushland, shrubby fencerows, haystacks, brushpiles, and around farm buildings (Hoffmeister and Mohr, 1957). Primarily an upland species, long-tailed weasels will frequent steeper hillsides and farmed or pastured areas in river bottoms and bluffs

(Brown and Yeager, 1943). The species is probably rare is the bottomlands part of the study area, occurring only around farm houses; the wooded hillsides of the upland probably contain a few more.

White-tailed Deer

The only big game animal in Illinois is the white-tailed deer. This species was practically eliminated from the state by the turn of the century; restocking efforts during the 1930s resulted in the return of deer to all of Illinois (Calhoun and Loomis, 1974). Although found in a wide variety of habitats, deer prefer woods and thickets that alternate with open fields (Hoffmeister and Mohr, 1957).

Small numbers of deer have been harvested annually since 1966 from Madison County (Calhoun and Loomis, 1974). In 1977, an unofficial tally of forty-seven deer were reported for the county (Anonymous, 1978). There would be limited occurrence of this species in the wooded areas around the two lakes, and along and in the upland areas but probably not within the suburbs.

Other

Other furbearers that previously may have occurred in the study area but were subsequently excluded for various reasons include the bobcat, cougar, river otter, and black bear.

UPLAND GAME BIRDS

The major species of upland game birds which may occur in the study area are mourning doves, bobwhite quail, and American woodcock. Madison County lies outside the edge of the ring-necked pheasant range in Illinois although occasionally individuals of this species are taken there

(Preno and Labisky, 1971). However, these probably do not reflect any aspect of natural reproduction.

Mourning Doves

During 1956 to 1969, Madison County led the state in both numbers of mourning doves harvested and number of hunter trips (Preno and Labisky, 1971). From 1970 to 1972, an average of 75,800 per year were taken (Ellis, 1974, in Terpening, et al., 1975). This species prefers open country with scattered woody plants (Edminster, 1954) and it feeds in edge shrubs, hedgerows, sweet clover fields, prairie or ungrazed grasslands, orchards, marshes, urban residential areas, and fallow fields (Graber and Graber, 1963). Within the study area, this species commonly nests in wooded residential areas and farmsteads, and woodlot edges. Because it regularly feeds on waste grains and weed seeds, cultivated fields within the area will be extensively used during fall and early winter.

Bobwhite Quail

In Madison County, during 1970 and 1972, an annual average of 46,900 bobwhite quail was harvested (Ellis, 1974, in Terpening, et al., 1975). This county led the state in the number of hunter trips for this species during 1956 to 1969 (Preno and Labisky, 1971). The bobwhite may be locally abundant where there is a combination of agricultural and forest lands (Preno and Labisky, 1971), and it also occurs in shrub areas, orchards, hayfields, ungrazed grasslands, and pasture (Graber and Graber, 1963). The interspersion index (Baxter and Wolf, 1972) was originally devised to evaluate bobwhite habitat and the low indices found for most of the study area indicate poor habitat for bobwhite. This species is absent from intensely farmed or developed areas but it may be found where

cultivated land, woodland, old field and/or vegetated rights-of-way intersect. This species is, therefore, probably more abundant adjacent to and in the uplands.

American Woodcock

From 1970 to 1972, 939 American woodcocks were taken in Madison County (Ellis, 1974, in Terpening, et al., 1975). This is a species of moist woodlands, swamps and thickets (Robbins, et al., 1966). It uses open brushy or wooded areas for nesting, moist soft ground for foraging, and is usually found near streams and in moist woods during late summer and migration (Edminster, 1954). The only adequate habitat for this species in the study area is the moist woods adjacent to Horseshoe and McDonough Lakes, and perhaps in the lower parts of the hillsides of the upland portion.

Others

Other upland game species within whose range the study area falls include common snipe, common gallinule (considered threatened in Illinois), sora, and Virginia rail. These species may utilize shallow waters and the shores of the two lakes. Although within the range of the wild turkey, this species is not believed to occur in the study area.

WATERFOWL

The study area lies within the Mississippi Flyway, with an estimated 12,275,000 ducks utilizing it each fall from 1960 to 1966 (excluding blue-winged teal). Also recorded were an estimated 475,000 Canada geese and 400,000 to 450,000 lesser snow geese (Bellrose, 1968).

Waterfowl hunting occurs on Horseshoe Lake and totals of 804

hunter-days in 1974 and 839 in 1975 were expended at the private hunting club (Houk, 1976). Numbers and species of waterfowl harvested during these years appear in Tables XI-1 and XI-2.

The only suitable habitats for waterfowl are Horseshoe and McDonough Lakes, however smaller ponds throughout the area may be utilized, especially by the dabblers. Mallards and wood ducks may breed at these sites while other species will utilize these areas during migration and sometimes winter.

Dabbling Duck

Of the dabbling ducks that utilize this flyway, the mallard is most abundant followed by pintail, American widgeon, green-winged teal, gadwall, and shoveler (Bellrose, 1968). However, the blue-winged teal, black duck, and wood duck are regularly recorded. Mallards constituted twenty-six and four tenths percent of the ducks harvested at Horseshoe Lake during 1974 and 1975 (as can be seen from Table XI-1).

Dabbling ducks usually are found on shallow water, such as marshes, sloughs, and ponds. Teal prefer feeding on mudflats, while mallards, widgeons, black ducks, and wood ducks will utilize cultivated fields (Bellrose, 1976). Mallards, gadwalls, widgeons, black ducks, and wood ducks may winter along the Mississippi River in and around the study area. Wood ducks will breed in floodplain and upland woods within a mile of water (Bellrose, 1976). The study area lies within the breeding range of this species.

Diving Duck

Of the diving ducks, lesser scaups are the most abundant (Bellrose,

Table XI-1

Species Composition of the Duck Harvest at Horseshoe Lake
During the 1971 and 1975 Waterfowl Seasons*

Species	Number Harvested During 1974 Season	Percent	Number Harvested During 1975 Season	Percent	Two-Year Total of Ducks Harvested	Percent
Lesser Scaup	553	45.8	523	35.1	1076	39.9
Mallard	334	27.7	377	25.2	711	26.4
Ring-necked Duck	98	8.1	111	7.4	209	7.8
Redhead	54	4.4	98	6.6	152	5.6
Green-winged Teal	20	1.6	78	5.2	98	3.6
Ruddy Duck	33	2.7	38	2.6	771	2.6
Gadwall	5	.4	54	3.6	59	2.2
Bufflehead	20	1.6	33	2.2	53	2.0
Blue-winged Teal	26	2.1	24	1.6	50	1.9
Pintail	17	1.4	32	2.1	49	1.8
Widgeon	4	.3	40	2.7	44	1.6
Wood Duck	12	.9	23	1.5	35	1.5
Shoveler	8	.6	12	.8	20	.7
Black Duck	3	.2	11	.7	14	.6
Hooded Merganser	6	.5	6	.4	12	.4
Goldeneye	5	.4	7	.4	12	.4
American Scoter	2	.1	8	.5	10	.4
American Merganser	2		7	.4	9	.3
Red-breasted Merganser	1	.1	2	.1	3	.1
White-winged Scoter	3	.2	0	.0	3	.1
	0	.0	3	.2	3	.1
Greater Scaup	0	.0	3	.2	3	.1
Surf Scoter	0	.0	2	.1	2	
TOTAL	1,206	99.	1,492	99.6	2,698	100.0

*From Houk (1976).

Table XI-2

Species Composition of the Goose Harvest at Horseshoe Lake During the 1974 and 1975 Waterfowl Seasons*

Species	Number Harvested During 1974 Season	Number Harvested During 1975 Season	Two-Year Total of Geese Harvested	Percent
Common Canada Goose	6	14	20	39.2
Richardson's Goose (subspecies of Canada goose)	5	7	12	23.5
White-fronted Goose	1	9	10	19.6
Blue/Snow Goose	3	4	7	13.7
Black Brant	2	0	2	3.9
TOTAL	17	34	51	99.9

*From Houk (1976).

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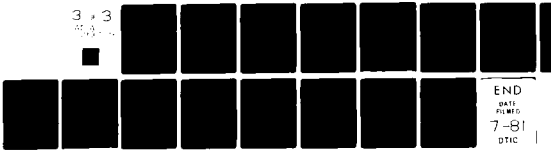

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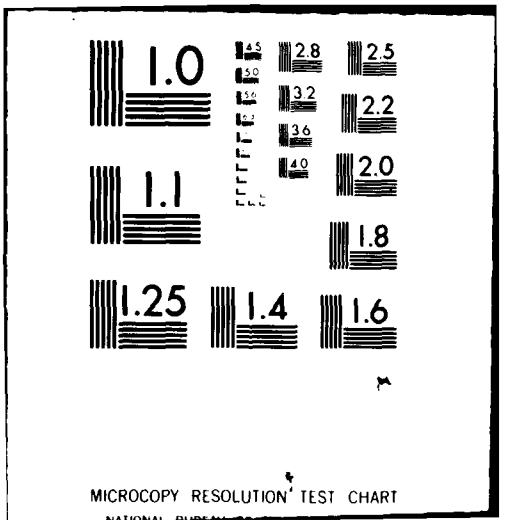
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MICROCOPY RESOLUTION TEST CHART

1968). They accounted for forty percent of the ducks harvested at Horseshoe Lake during 1974 and 1975 (as presented in Table XI-1). Other diving ducks included the ring-necked, redhead, canvasback, common goldeneye, blufflehead, ruddy, and great scaup. Divers usually feed in deeper water although ring-necked and redhead prefer shallow marshes, sloughs and ponds. All of these species may be found wintering along the Mississippi Flyway and within the vicinity of the study area.

Scoters and Oldsquaw

The American, white-winged and surf scoters and oldsquaw were sparsely represented in harvest at Horseshoe Lake during 1974 and/or 1975; most are uncommon in the study area.

Mergansers

Common, red-breasted and hooded mergansers migrate through the study area and all may winter in the vicinity. The study area is within the breeding range of the hooded merganser, but this species is very sensitive to both water quality and disturbance by man (Bellrose, 1976) and probably does not breed there. American coots may breed and do migrate through the study area, perhaps utilizing the two lakes.

Geese

During 1974 and 1975, sixty-three percent of the geese harvested at Horseshoe Lake were Canada geese (as presented in Table XI-2). This species and lesser snow geese use this flyway as a major migration corridor. Both species may on occasion feed on waste grain in cultivated fields, particularly in the vicinity of the two lakes in the study area. White-fronted geese and more rarely black brant did occur at Horseshoe Lake during 1974 and/or 1975.

IMPORTANCE OF THE STUDY AREA FOR HUNTING

Preno and Labisky (1971) noted from 1956 to 1969 the greatest relative hunting pressure for upland game (squirrels, cottontails, mourning doves, and pheasants) in Illinois was exerted in counties containing or surrounding metropolitan areas. Madison County, which contains the study area, ranked second in the state in the number of hunter-trips expended there, yielding 1,253,000 hunter-trips annually for 1956 to 1969. This county ranked fifth in the state in the number of animals harvested per 1,000 acres (Preno and Labisky, 1971).

The extensive development (at least thirty-six percent) of the study area severely reduces the amount of land available for hunting, while the intensive cultivation (forty-five percent), especially in the floodplain, severely reduces the quality of the huntable land. Most of the habitat variety that exists in the floodplain is a result of development encroaching upon the cultivated land. This is of some advantage to certain wildlife species, but does not provide for additional hunting opportunities where they are most needed, namely, adjacent to concentrated urban centers.

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SECTION XI I
BIOLOGICAL ELEMENTS
PESTIFEROUS PLANTS AND ANIMALS

PREPARED BY

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PESTIFEROUS PLANTS

Several mildly pestiferous plants were observed. Species which attach to clothing and animals included two species of beggarticks, cocklebur, bedstraw, and tick trefoil. Species which are prickly included greenbriar, multiflora rose, and brambles. Thorny tree species included two species of hawthorns and honeylocust. Species which cause blisters or skin inflammations included poison ivy (numerous) and two species of nettles (numerous). Poison ivy and nettles are quite common to sandy bottomland soils and are to be expected throughout the study area.

PESTIFEROUS ANIMALS

According to the Public Health Study Team of the Environmental Studies Board (National Research Council, 1976) mosquitoes are by far the most important arthropods subject to control for general health reasons in the United States. Mosquitoes are a perennial problem in the American Bottoms because of spring flooding and because of the long, wet summers of the region. Drainage, as through the Cahokia Creek system, and mosquito control efforts by most communities in the area serve to reduce the problem.

Of fifty-seven different species of mosquitoes that have been taken in Illinois according to Ross and Horsfall (1965), forty-seven are likely to occur in the Cahokia Creek Drainage Area. An additional few species previously reported for Missouri by Smith and Enns (1968) may occur in the area. Of a potential fifty species which may be found in the area, only seven species are a major nuisance to people.

These are as follows: Aedes sticticus, Aedes vexans, Anopheles punctipennis, Anopheles quadrimaculatus, Culex erraticus, Culex pipiens, Culex salinarius.

Aedes vexans is undoubtedly the major pestiferous species in the area because of its abundance and because it is one of the fiercest day biters of people. It is important, however, only as a nuisance since it is not an important disease vector for people. Several mosquitoes can act as vectors for disease in this area, specifically for viral encephalitis and malaria.

While endemic malaria was once common to the Mississippi Valley, including this area, it has now been several decades since it has occurred in this form. Since, however, malaria is constantly being introduced into the United States (including Illinois and Missouri) from foreign countries where it is endemic, and since five species of Anopheles mosquitoes including two common nuisance species occur locally, the potential exists for malaria to become endemic once again in the area. In 1978, according to the Center for Disease Control (1979), fourteen cases of malaria were reported in Illinois, ten cases in Missouri.

St. Louis encephalitis (SLE) has occurred in epidemic proportions several times in the St. Louis Metropolitan Area. The most recent epidemic of SLE in the United States occurred in 1975 when 1,995 cases were reported (CDC, 1976), of which 640 cases were reported in Illinois and thirty-five in Missouri. Several species of Culex, particularly C. pipiens, are vectors for this viral disease. According to James,

et al. (1969), the SLE virus basically has an active mosquito-bird cycle with man being an accidental end point. Epidemics have been shown to have a temperature dependence in the United States with maximal activity following unusually warm spring temperatures.

In Illinois in 1975 there were reported a number of other arthropod borne viral encephalides, four cases of Western Equine Encephalitis and twenty-three cases of California Encephalitis (CDC, 1976). Species of Culex have been identified as vectors of the former and suggested as vectors of the latter. Only one case of arbovirus encephalitis has been reported in Illinois and none in Missouri since 1975 (CDC, 1978).

Dirofilaria immitis, a filarial worm of dogs which is cosmopolitan in nearly all tropical and subtropical regions of the world (James, et al., 1969), has been reported recently by Jaskowski (1978) to occur in every county in Illinois. This species invades the heart and pulmonary arteries of the host where it may cause death. Many species of mosquitoes have been shown to be vectors of this disease organism. Dirofilaria can constitute a health problem for man and cases are reported by Beaver and Orihel (1965).

Breeding sites of the important genera of mosquitoes are common throughout the area. Culex pipiens, a domestic species which invades houses freely, lays its eggs in rafts in water, in rain barrels, tanks, cisterns, catch basins, and other small collections of water, favoring waters with high organic pollution (James, et al., 1969). Aedes vexans is a typical flood water mosquito which lays its eggs along the muddy edges of receding pools, where they hatch when inundated with water, either the same season or the following season. Anopheles quadrimacu-

latus breeds in clean impounded waters with floating debris and aquatic vegetation, requiring both sunlight and shade.

Other pestiferous insects of lesser importance in the area include several biting flies, e.g., some black flies (Simuliidae), sand flies (Phlebotominae), biting midges (Ceratopogonidae), horse flies and deer flies (Tabanidae), and the stable fly, Stomoxys calcitrans (Muscidae). Several of these types of flies are recognized vectors of serious diseases in other countries. Many non-biting flies, particularly the house fly and numerous species of non-biting midges (Chironomidae) frequently constitute a major nuisance because of their numbers. In addition to the flies (Diptera) several ants, bees, wasps, and hornets (Hymenoptera) in which the females have stingers are a major cause of discomfort and death. Parish (1963) showed that approximately 230 deaths were caused in the Unites States by hymenopterous insects over the period 1950 to 1959. Some of these deaths are caused by the venom or poison injected at the sting, others by the allergic reaction due to sensitivity to protein in the venom.

Other pestiferous arthropods in the Cahokia Creek Drainage Area include some Arachnoidea, specifically some ticks, mites, and spiders.

Stannard (1967) states that three ticks of fifteen species recorded from Illinois are dangerous because they are proven vectors of diseases often fatal to man. Dermacentor variabilis, the wood tick or American dog tick, is the most dangerous from the human viewpoint because it is found throughout the state, being most common in the south. Only the adults attack man and dogs, reaching a peak

in May through July. It is a vector of Rickettsia rickettsii, the cause of Rocky Mountain Spotted Fever. Small rodents, rabbits and the opossum have all been shown to be reservoirs of this disease organism (James, et al., 1969). Of 1,011 cases of Rocky Mountain Spotted Fever reported in the United States in 1978, twenty-five occurred in Illinois, twenty-three in Missouri (CDC, 1979b). Only three cases were reported in Illinois in the first six months of 1979 (CDC, 1979b). Rhipicephalus sanguineus, the brown dog tick, although common and widespread, seldom bites man (James, et al., 1969). Amblyomna americanus, the Lone Star Tick, bites man in all its stages — larvae, nymphs and adults (Stannard, 1967). It is found primarily in southern United States, but has occurred with increasing frequency in southern Illinois. While transmitting Rocky Mountain Spotted Fever in Latin America, it has not been demonstrated yet to transmit it in the United States. Its bite, however, is extremely irritating with itching often persisting for weeks. Rabbits are a favorite host of this tick which can mechanically transmit tularemia, a bacterial disease caused by Pasteurella tularensis. No tularemia was reported in Illinois in 1978, but eighteen cases were reported in Missouri that year (CDC, 1979a). Most cases of tularemia probably occur as result of direct contamination from rabbits while they are being cleaned. Fluid of infected rabbits contacting mucous membranes or entering small cuts or scratches may result in infection.

Several species of chiggars (Eutrombicula) cause dermatitis in the United States (James, et al., 1969). Chiggars do not burrow into the skin, but rather produce the severe itch three to six hours

after feeding on the skin as a result of the digestive fluids they inject at the bite. These bright red mites drop off the host after feeding. They are widespread in Illinois and Missouri and may be abundant locally.

Two spiders which occur in the Cahokia Creek Drainage Area are particularly dangerous. The black widow spider (Latrodectus mactans) and the brown recluse spider (Loxosceles reclusa) both occur with frequency in the area. The black widow bite results in severe muscular pain, difficulty in breathing, and nausea generally accompanied by profuse sweating but symptoms wane after two to three days. The bite of the brown recluse, on the other hand, is localized, producing considerable local necrosis which lasts for weeks and often results in a scar. In addition, systemic symptoms are common. The black widow is most often found around out-buildings and materials stored outside. The brown recluse, particulary in its northern range as in this area, is within homes, frequently in boxes in the home (James, et al., 1969).

The massasauga, a swamp rattlesnake, Sistrurus catenatus, occurs within the Cahokia Canal Drainage Area. One specimen, collected at the northeast edge of the Southern Illinois University at Edwardsville campus, is in the SIUE collection. Several other specimens from within the study area have been observed by Dr. Ralph Axtell of the SIUE Department of Biological Sciences. This rattlesnake, while poisonous, is not dangerous because of its small size. In addition, it is not common, being found primarily in inaccessible swampy areas.

The timber rattlesnake, Crotalus horridus, and the copperhead snake, Agkistrodon contortrix, do not occur within the study area but are found just west of Alton, Illinois, along the Mississippi River bluffs. The cottonmouth, Agkistrodon piscivorus, has its northernmost occurrence in Illinois in southwestern Monroe County considerably south of the study area. The last three species have bites which are considered from serious (cottonmouth) to dangerous (copperhead and timber rattlesnake).

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SECTION XIII
BIOLOGICAL ELEMENTS
THREATENED AND ENDANGERED SPECIES

PREPARED BY

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RICHARD D. PARKER, PH. D.

GENERAL

Wetland and prairie communities, once abundant in the Cahokia Drainage Area, are now scarce as a result of extensive land development. Two small prairies were identified in the bottomlands as shown in Table IX-25 in Volume 3 of 6. Wetlands (Figure VI-1)* now include mostly shallow water, marsh, wet meadow and swamp communities concentrated at the margins of lakes and ponds. These two community types (wetland and prairie), though now greatly reduced, are unique habitats in which locally and nationally rare species may live. In particular, wetlands are essential to many aquatic birds. A gradual loss of wetland habitats has taken place across the nation since settlement and is still going on. Although a small bit of wetland habitat in the Cahokia Canal Drainage Area might seem rather unimportant in itself, the nationwide destruction of many such insignificant bits of habitat will eventually mean the destruction of the whole wetlands ecosystem, including those species which are of value to humans and which are dependent on wetland habitat.

Wetlands are well known to be essential to migrating waterfowl, and protection of wetlands, or mitigation of their destruction, is therefore to be encouraged. Though relatively little wetland is left in the Cahokia Canal Drainage Area, its usefulness to waterfowl could be greatly increased, not only through preservation of the wetland which still exists, but also through buffering these wetlands from urban development or

*All Figures referred to are located in Volume 6 of 6 of this Environmental Inventory Report.

agricultural activities which tend to inhibit utilization of wetlands by waterfowl. The development of needed buffers and protection of existing buffer areas (old fields and bottomland forests) to screen and separate developed land from existing wetland is desirable.

THREATENED AND ENDANGERED PLANTS

The list of plant species proposed by the Department of the Interior as endangered or threatened originally consisted of 2099 species (Anonymous, 1975, 1976). Recently, however, the list was abbreviated and it now includes fifty-six species from the United States (Anonymous, 1980). The area of the St. Louis District was found by the Corps of Engineers (1976) to contain one endangered and eleven threatened plant species in Illinois and three endangered and seven threatened species in Missouri. These species were based on a Federal Report (Anonymous, 1975). None of these species was observed in the study area. Furthermore, no species from the current list of endangered and threatened species (Anonymous, 1980) are known to exist in the Illinois - Missouri area (and therefore in the study area).

The study area has been largely denuded of original vegetation by development. This implies that fence-row and stream-bank species predominate along with the less abundant species of the occasional wetlands, prairies, and woods. Although only selected sites were sampled for plant species in a relatively large area, these sites probably contained a great proportion of the species of plants which exist in the study area.

It is likely, therefore, that no plant species of the Federal List of Endangered or Threatened Species exists in the study area.

THREATENED AND ENDANGERED ANIMALS

In a telephone conversation with a representative of the U.S. Fish and Wildlife Service (Mr. M. Bailey, December 29, 1980), called by J.E. Thomerson, we were advised that four species on the Federal Endangered Species List are of possible concern, however no species on the Federal Threatened Species List are thought to occur in the Cahokia Canal Drainage Area. The bald eagle and peregrine falcon are documented from the area (Becker, 1980). The study area is within the range of the Indiana bat and the gray bat, but their actual utilization of the area is not documented (Becker, 1980).

Bald Eagle, Haliaeetus leucocephalus

Bald eagles winter in the area and have been observed fishing in Horseshoe Lake (Becker, 1980). Bald eagles feed on sick or wounded waterfowl and fish. They basically need areas of open water to fish and hunt in, day loafing areas and night roosting areas. They generally use large trees with open horizontal branched structures, such as cottonwoods, sycamores, silver maples and various dead trees. Night roosting is generally in protected valleys in bluff areas (Steenhof, 1978). They are somewhat tolerant of human activity during fishing but are more intolerant during loafing or night roosting (Becker, 1980). The nearest roosting concentration is at Pere Marquette State Park, approximately forty kilometers north of the Cahokia Canal Drainage Area.

Improvement of fisheries in the area, particularly in Horseshoe Lake, would be of obvious benefit to the eagles so long as human winter activity levels in the fishing area do not surpass the eagles' toleration level. Removal of large trees used for hunting perches or loafing would be detrimental.

Eagles are not known to use the Chouteau Island area, but there are some large trees along the river and a fairly productive (fish) area of the Mississippi River at Chain of Rocks. If they do not utilize this area, it is probably because the level of human activity is beyond their tolerance limit.

Peregrine Falcon, Falco peregrinus

Peregrine falcons migrate through the Cahokia Canal Drainage Area, with more fall than spring records (Becker, 1980). Since peregrine falcons are bird hunters, actions to increase bird, particularly waterfowl, populations in the area would be beneficial to them. Flocks of pigeons are common in the area and these are suitable prey for peregrine falcons.

Indiana Bat, Myotis sodalis

Although there are no documented records of the Indiana bat in it, the Cahokia Canal Drainage Area is within the species range. Indiana bat nursery colonies use riparian vegetation along small streams and rivers. Foraging, particularly of females, is closely associated with stream-edge trees (Cope, et al., 1974; Cope, et al., 1978; Humphrey, et al., 1977). Indiana bats avoid open fields and other areas lacking trees. Males are known to forage along wooded hillsides in Missouri (LaVal, et al., 1977).

The summer roost of the males is usually located in a tree over water and not far from the cave hibernacula occupied in the winter (Hall, 1962; LaVal, et al., 1977).

No caves are known in or near the study area, although there are various abandoned coal mines which might serve the purpose. Most of the small streams (and ditches) of the area are not lined with the preferred mature riparian vegetation, although such habitats do exist, for example: along the Cahokia Drainage Canal and Creek in the north, south of the Cahokia Diversion Canal, along the northern end of Long Lake, and along the lower part of the Cahokia Drainage Canal. There are also areas of mature riparian vegetation along parts of the Cahokia Diversion Canal but only open grass levee along the Chain of Rocks Canal.

If Indiana bats do utilize the area, then further loss of mature riparian vegetation on the floodplain and hillside forest in the uplands would be detrimental to their well-being.

Gray Bat, Myotis grisescens

The study area falls within the range of the gray bat, but there are no records of its occurrence there (Becker, 1980). Gray bats are closely associated with caves and there are no caves known in Madison County (Bretz and Harris, 1961). Tuttle (1974) showed that gray bats prefer caves closer than four kilometers to a large river or lake. It is unlikely that such a combination occurs in the study area and there need be little consideration given to the gray bat in the study area.

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